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A SERIES OF ARTICLES ON SPEECH-
DEFECTS AS LOCALIZING SYMP-
TOMS, FROM A STUDY OF SIX
CASES OF APHASIA.

III

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NEUROLOGIST TO THE ARAPAHOE COUNTY AND ST. LUCIE'S HOSPITALS.

FROM
THE MEDICAL NEWS,
June 9 to Sept. 19, 1896.

L 383
A6 E7
1896



Caryford Bros.
Makers
Syracuse, N.Y.
Pat Jan. 21, 1906



[Reprinted from THE MEDICAL NEWS, June 6, 1896.]

L 383
A 6 E 7

TRAUMATIC HEMORRHAGE IN THE CENTRUM
1896 OVALE BENEATH THE LEFT AN-
GULAR GYRUS.

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IN the report of this case of aphasia, and in each of those which are to follow, the history of the case, the results of the examination, remarks on the diagnosis and points of surgical interest will be given. A detailed account of the rather elaborate plan pursued in investigating the different forms of aphasia will be stated in full without any apology for the amount of space consumed, as it is believed the interesting features presented by each case will justify the careful study which one of us has endeavored to devote especially to the character of the speech disturbance.

The plan followed in the study of the aphasia, which includes thirty subheadings, will be given but once, and each subheading will subsequently be referred to by number.

After this series of cases of aphasia have been reported the points of interest, in each case will be discussed in a subsequent paper and published in this journal.

CASE I.—*History, Examination, and Diagnosis.*—William D., colored, aged twenty-three years, single, waiter by occupation, was admitted into St. Luke's Hospital, June

W 1895: The family history is unimportant. He was always in good health up to a short time ago. He has drunk a great deal, but denies syphilis, although he has suffered from gonorrhea a number of times, and has indulged in venery to excess. Early in March, 1895, while in a fight he fell and broke both bones of his right leg just above the ankle. He was taken to the County Hospital, and was under the care of the attending surgeon, Dr. Rogers. After he had been there about two weeks he was attacked by another patient who struck him on the head, just above the right eye, with a chair, and felled to the ground. He was unconscious from the blow only a few hours. After recovering consciousness he suffered from pain in the head and felt dizzy for a week or more, but two weeks later he was able to return to his work. He made no complaint except that when he blew his nose he experienced pain in his right eye. He continued at his work, feeling quiet well, until June 13, 1895. On the morning of that day he complained of headache, but performed his duties as waiter until about 5 P.M., when he was found in the yard, in the rear of the house, lying apparently asleep. When aroused he placed his hand to his head, moaned, said something, but "his words were so confused" that his uncle was not able to understand him. After a time he was found wandering about the building, and apparently did not know what he was doing. He was taken home and put in bed. He was very restless, seemed dazed, semi-conscious, talked incoherently, refused food, but drank milk and soups when they were offered him. He remained in about this condition during the next three days. He was removed to St. Luke's Hospital on June 16th, at 9 P.M. I saw him an hour later, and found him lying in bed apparently asleep, and when he was undisturbed he did not complain. On arousing him and asking him if he had a headache he replied, "Yes," and placed his hand over

tire front of his head, indicating the seat of pain. As well as I could determine from his answers to my questions, the pain was limited to the front of the head, but felt on both sides. He seemed to be semi-conscious, but the blurred consciousness was complicated with a sensory aphasia. He seemed to understand most of what was said to him, but in answering questions he not infrequently used wrong words and apparently did not perceive his mistakes. After he was aroused he was quite restless, moaned considerably, and the forehead was corrugated, indicative of pain.

There was no apparent paresis or paralysis of any muscles of the legs, arms, or face. It was impossible to test accurately the strength of his muscles on account of his inability to concentrate his mind, I could not attract his attention for more than a moment at a time, and as soon as I left him alone he relapsed into a stuporous condition. He registered, however, with the right hand fifty, and with the left forty on the dynamometer, but he only accomplished this on urging him in loud tones to press hard. The tongue was protruded in the median line. Reflexes: knee-jerks were normal; ankle-clonus and plantar reflexes were absent; tendo-Achillis, normal; cremaster and lower abdominal reflexes were absent. Epigastric, R. present; L. absent. Deep reflexes of the arms were about normal. Masseters absent. Sensation seemed to be blunted over the right side, as a pin prick on this side did not attract his attention, or cause him to wince as it did when he was pricked on the left side. On first testing vision he was apparently blinded on the right side of each eye, but this could not be confirmed by subsequent tests, on account of his blunted mental condition. All the internal and external ocular muscles seemed to act normally, pupils contracting to light and accommodation readily. Both optic disks were very small, looked pale, and their appearance was suspicious of beginning atrophy; the vessels, especially the ar-

teries, appearing smaller than normal. No exudate could be observed on either disk. I was unable to test the condition of the other special senses on account of his blunted mental state.

On endeavoring to test the condition of the aphasia I asked him if he could hear the watch, and he said, "That is a beer." I tried him again, and he said, "That is another beer." When I touched him on the right side I asked him if he could feel me, he said, "I cannot hear," meaning that he could not feel. I asked him if he felt me touch him on the left side, and he answered promptly, "Yes, I can see it." On the left side he seemed to distinguish readily between hot and cold substances, but his words were so confused that it was impossible to make out what he said. The whole examination, especially in regard to the special and general sensory phenomena, was very unsatisfactory. The temperature in the right axilla was 99°; left 99.4°; pulse 48, not very full and rather poorly sustained; respiration 17 and regular. When left alone while he was apparently asleep, or in a stuporous condition, sighing respiration would occasionally occur, and he would moan and rub his head as if in pain. During the night he was quite restless and required rather large doses of cannabis indica to secure any rest at all. His temperature was registered in each axilla every three hours during the night, and was found nearly normal or slightly subnormal, and about the same in each axilla. The next morning there was a slight retraction of the head and some rigidity of the posterior cervical muscles. The ears were carefully examined but no discharge or evidence of disease was found. On shaving the head no depression of bone was detected. At noon he registered on the dynamometer R. 132, L. 128. He remained in about the same condition during the entire day, and at 6 P.M. the head seemed to be a little more retracted than it was in the morning. On my endeavoring to bring it forward it

evidently gave him pain. The right side of the face, especially around the mouth, was a little paretic; the tongue was protruded in the median line. The deep reflexes were about normal, while the superficial were abolished on the right side and present on the left. On retesting for hemianopsia I was unable to verify my observations of the night before, but there was perceptible blunting of sensation throughout the entire right side. During the following night he rested quietly with twenty minims of the normal liquid of cannabis indica every hour.

From the time that the patient had been admitted into the hospital, on the evening of June 16th, until the morning of the 18th, a careful record of the pulse, respiration, bilateral axillary temperature, and all other symptoms likely to aid in arriving at a diagnosis had been made every three hours. On the evening of his admission, the temperature in the left axilla was about 1° F. above normal, and $\frac{1}{2}$ above normal in the right; the pulse was 48, with fair volume, but easily compressed; respiration was 17, regular, except an occasional sigh, apparently on account of pain. It was thought that the slight elevation of temperature might have been caused by the jolting in removing him from his lodging-house to the hospital. Three hours later, the temperature had fallen $.6^{\circ}$ in the left axilla, but remained about the same in the right, so that it was a little higher on the right than on the left side. The pulse had risen from 48 to 55, and respiration remained about the same. From 2 A.M. of the 17th to 6 P.M. of that day, the temperature was practically normal and about the same in each axilla; the pulse varied from 48 to 58, and respiration from 16 to 18. Neither the pulse nor respiration changed in character, but the patient was gradually becoming more stuporous. At noon of the 17th, after the head had been carefully shaved and dried, the surface temperature of each side of the head in the frontal and parietal regions were carefully registered

by myself. The thermometers were allowed to remain in position from ten to fifteen minutes, or three minutes after the mercury ceased to rise. Two thermometers were used, and the temperature over corresponding portions of the head was taken at the same time. Lateral frontal. R. 96.5°; L. 97°. Parietal: R. 96.8°; L. 97.2°. Lest there should be some difference in the thermometers, these were now reversed and the temperatures again recorded, with the following results: Lateral frontal: R. 96.4°; L. 97°. Parietal: R. 96.8°; L. 97.2°.

At 6 P.M. of the same evening (June 17) the temperature was: R. axilla 99.2°; L. 98.4°; P. 52; R. 18. At 10 P.M., temp. in R. axilla, 98.5°; L. 98.4°; P. 50; R. 16. He was very restless, and the stupor was apparently increasing.

At 1 A.M. of the 18th, temp. R. axilla 99.5°; L. 98.5°; P. 52; R. 16. At 4 A.M., temp. R. axilla 96.5°; L. 95.5; P. 52; R. 16. At 7 A.M., temp. R. axilla 96.8°; L. 96.6°; pulse and respiration the same. At 8.30 A.M., temp. R. axilla 98.6°; L. 98.4°; P. 48; R. 18. The patient was in a more stuporous and apathetic condition than at my visit the evening before, and it became evident that unless something surgically could be done for his relief, death would soon result.

The condition of the optic disks had not perceptibly changed since I first saw him; there was no paresis or paralysis of any muscles; the ability to recognize a pin prick throughout the entire right side was almost entirely lost, and response to irritation of the left side, owing to the increasing stupor, was becoming lessened; he could hear and seemed to understand, when aroused, many things that were said to him, but when he attempted to answer even simple questions, which it was difficult to arouse him sufficiently to do; his words, although articulated distinctly, had no meaning as they were jumbled together in a confusing manner.

My first endeavor, before recommending a surgical operation, was to determine, if possible, the character of the brain lesion, and next to locate it.

The head injury, received some three months before, taken in connection with his history for the past five days since the onset of the acute symptoms, indicated that within the brain substance some subacute or chronic process had been going on, and that this had resulted in rather extensive destruction of brain tissue.

Was it abscess, encephalitis, or hemorrhage? The symptoms of injury to the brain of traumatic origin, sufficient to give rise to decided disturbance, came on immediately after the receipt of the trauma; those that result from inflammation are not usually apparent before the second to the fourth day; while those of abscess rarely appear before the second or third week, and may be delayed much longer. Hemorrhage into the brain substance may occur immediately after the head injury, several days, or even months subsequently to it. Delayed or late hemorrhage into the brain substance from traumatism probably only takes place as a result of previous encephalitis and softening. Sudden symptoms of brain lesions may occur in syphilitic subjects weeks or months after an injury to the head, and may be due to thrombosis of a vessel or gumma of the membranes. It is a well-known fact that traumata to the head frequently light up latent syphilis of the brain. Extensive meningeal lesions, especially of syphilitic origin, rarely come on suddenly. They are preceded by violent headache and are attended by a rise of temperature, and frequently by twisting of the facial muscles, or general convulsions. Syphilis affects the large arteries at the base most, and a thrombotic occlusion of a vessel under such circumstances is usually attended by motor aphasia or hemiplegia, or by both.

In the patient whose case is under consideration, the

unconsciousness which immediately followed the injury, and lasted only about three hours, could be accounted for on the theory of concussion of the brain from the force of the blow. The symptoms of cerebral disturbance, consisting of slight headache and dizziness, lasting for about two weeks, must have been insignificant, as he did not call the attention of the attending surgeon to them. In the patient's semi-conscious condition, when I saw him, it was impossible to learn whether the headache and dizziness were worse immediately after the receipt of the blow to the head or two or three days subsequently to it. Had these symptoms developed a few days after the injury, they would have pointed to encephalitis. But had a slight encephalitis occurred, this might have been followed by hemorrhage or suppuration.

The head injury attended by an open scalp wound, the slight cerebral disturbance for two weeks, the latent period of nearly three months duration during which he was able to walk, although he did not feel entirely himself, especially in regard to his head, the sudden development of profound brain symptoms, and the vacillating temperature, varying from one degree Fah. above normal to two degrees below, with slow pulse and respiration, certainly pointed very strongly to abscess of the brain. The mental apathy, with power to comprehend for a moment when aroused, but inability to maintain mental concentration for more than a few moments at a time, is found most typically illustrated in abscess of the brain. The patient was a colored man, and the peculiar dusky yellowish hue, so often seen in cases of abscess of the brain, could not have been detected in him had it been present.

The history and many of the symptoms of the case were more in favor of cerebral suppuration than of hemorrhage into the brain substance. There were, however, an absence of certain symptoms that one expects to find pres-

ent in the terminal period of chronic abscess of the brain. After this stage of chronic abscess of the brain is reached, the temperature begins to rise as the stupor and coma deepen. In this patient, the temperature was nearly two degrees Fah. lower than it had been thirty-six hours before, although stupor was more marked, and a fatal termination seemed to be threatened. With the rise of temperature in the terminal stage of abscess of the brain, the pulse and respiration increase in frequency in proportion to the destruction of brain function.

The behavior of the temperature, pulse, and respiration, with the increasing stupor in this patient, made me doubt the existence of an abscess, and suspect an encephalitis that had resulted in softening. If this condition existed, I reasoned that hemorrhage occurred into the focus of softening on the 13th, the time when the acute symptoms suddenly developed, and that there had been a recurrence of the hemorrhage on the morning of the 18th.

I confessed myself at the time unable to make more than a problematical diagnosis. I was inclined to regard the case as one of encephalitis with subsequent hemorrhage, although, as I told Dr. Rogers just before the operation, I would not be surprised to find an abscess. Had the patient's condition warranted delay in a surgical procedure, it is probable that a positive diagnosis could have been made.

The second problem to determine was in relation to the location of the lesion. This was not as difficult as at first it might seem. The patient was known to be right-handed, therefore the faculty of speech would naturally be located on the left side of the brain. There was a condition of sensory aphasia, without disturbance of motility, hearing, or motor speech, therefore the lesions must be on the left side and posterior to the temporal convolutions. Although his mental condition was such as to make it impossible to determine the exact character of the speech defect, the

visual fields, or other symptoms, it was quite evident that the lesion was in the region of the angular gyrus or posterior to it. The anesthesia throughout the entire right side, without hemiplegia, but with sensory aphasia, seemed to point quite definitely to the lesion being an extensive one in the centrum ovale of the parieto-occipital region, in such a position as to involve the fibers from the angular gyrus, the inferior parietal lobule, and probably those from the occipital lobe also.

Dr. E. J. A. Rogers, under whose care the patient had been while in the Arapahoe County Hospital, was requested to see the patient with me. On carefully studying the symptoms together, surgical means seemed to offer the only hope of relief. As the patient's condition was desperate and becoming hourly worse, he decided to operate at once, and in this opinion I concurred.

The operation was begun at 10.30 A.M. on June 18th, chloroform being the anesthetic used. The pulse before beginning the operation was 48; upon opening the skull it increased to 70, and upon the completion of the operation was 96.

The skull was opened by a $\frac{3}{4}$ -inch trephine at a point about $2\frac{1}{2}$ inches backward and upward from the external meatus,¹ and then enlarged by a rongeur-forceps. Pulsation was absent in the exposed area, but the dura bulged and showed great tension from internal pressure. The dura was divided and the brain explored by a canula, first forward and then inward without result. Upon exploring backward into the anterior portion of the occipital lobe, a mass of old clotted blood was found with a definite capsular limit. This area was washed out and quite a quantity of *debris* removed. No pus or other indication of inflammation was discovered. The wound was closed

¹ Dr. Rogers gets at this in a roundabout way. By actual measurement the point was $1\frac{1}{2}$ inches above the external auditory meatus and the same distance posterior to it.

without drainage. Upon warming the patient in bed the pulse immediately began to fall and steadily continued to do so, the patient remaining in a profound coma and symptoms indicating pressure becoming more and more marked.

On the day following the condition continued growing worse. At 5 P.M. the temperature in the left axilla was 99.2° ; the right 98.8 ; pulse varied from 44 to 48, and respiration was irregular and sighing from 8 to 12 per minute.

The condition of the patient seemed so hopeless that we deemed it best to again explore and try to relieve him. At 8 P.M. the sutures were removed and the cranial opening much enlarged downward and backward, and a sharp trochar with canula was then forced through the tentorium cerebelli, and the posterior fossa explored without result. The area discovered yesterday being now thoroughly uncovered was freely laid open and washed out and a much larger quantity of clots and *debris* removed. Drainage was left and the wound dressed. The patient again sank into the same state as before, but improvement was constant and regular from this time on, the results showing, I believe without question, that his sufferings were due to pressure produced in the area relieved.

After the second operation the pulse rose from 44 to 96; respiration from 12 to 22; the temperature remained nearly normal for about twelve hours. After this, the temperature rose from 1° to 1.5° above normal, then it dropped to normal a few hours later. The pulse varied from 92 to 98 for about thirty-six hours after the second operation, when it fell to 66 or 70 while he was asleep, and varied from 78 to 84 during his waking hours, the most of which time he was restless. Respiration did not fall below 17 or rise above 24 after the second operation. While no apparent shock followed the first operation, he seemed to be very weak after the second, and it was a

surprise to Dr. Rogers, the resident physicians, and myself to find him alive the morning of June 20th. From June 19th to the 24th the record is uneventful. During this time he took considerable liquid nourishment, appeared profoundly unconscious, and was quite noisy, especially during the night when he would frequently yell at the top of his voice. He was given twenty minimis of the normal liquid of cannabis indica every hour while he was noisy, usually with the effect to quiet him and make him sleep, after the second or third dose.

On the 24th, his pulse was observed to be 52 when he was asleep, but it arose to 75 on his awaking and becoming restless. It was noted that a pin-prick on the right side caused him to wince. From 1 A.M. to 6 A.M. of June 25th, he was very noisy and moaned continually, and at 7 A.M. the pulse registered only 42, the lowest it had been since the second operation. There were no other indications of increased cerebral pressure. After a free bowel movement the pulse registered 72 and he was partially conscious.

During the next two weeks he improved steadily, and by the end of this time he was quite rational and able to sit up an hour or two each day.

Examination July 7, 1895: There is no paresis or paralysis of any muscles. Dyn. R. 104; L. 130. Deep reflexes are nearly normal and about the same on each side of the body. The superficial reflexes are lessened on the right side, but normal on the left. Temperature and pain sensations apparently about equal on each side; tactile slightly lessened on the right; posture and pressure still more impaired, and muscular and localization sensations lessened to the greatest extent on the right side. Smell: He can detect an odor with either nostril, but does not seem able to name it. Hearing: Watch, R. $\frac{1}{8}$; L. $\frac{3}{4}$. Impossible to test him with the tuning fork as he becomes confused. Eyes: Central vision apparently

nearly normal; the external ocular muscles act well, and pupils respond to light and accommodation. Right bilateral homonymous hemianopsia apparently complete. No Wernicke pupillary phenomenon. Sensory aphasia is quite well marked, but he is fatigued and the examination has to be postponed.

On July 8th, I examined into his condition of aphasia. The plan that I am in the habit of using in examining these cases is elaborated from the one suggested by Dr. M. Allen Starr.¹

1. The power to recognize objects seen, heard, felt, tasted, smelt, and their uses.
2. The power to recall the spoken names of objects seen, heard, felt, tasted, and smelt.
3. The power to understand sounds other than speech.
4. The power to understand speech and music.
5. The power to call to mind objects named and point them out at request.
6. If word-deaf, can he recognize his own name when it is spoken?
7. The power to recognize a word spelled aloud.
8. The power to call up mentally the sound of a note, figure, letter, or word.

The examination thus far will test the various sensory areas, but more especially the auditory and the association tracts between the different sensory areas connected with speech.

9. The power to recognize letters, figures, notes, and colors seen.
10. The power to understand printed and written words seen.
11. The power to read printing, writing, and music aloud and inaudibly, and to understand what he reads.

¹*Medical Record*, October 2, 1888, p. 497, and *Brain*, vol. xii, 1889, p. 95.

12. The power to recall objects, the names of which are seen.

13. The power to write voluntarily.

14. The power to write at dictation.

15. The power to copy, and the manner of copying, printing, and writing.

16. The power to write the name of objects seen, heard, felt, tasted, and smelt.

17. The power to read aloud and inaudibly, and to understand what has been written.

18. The power to write his name and the ability to read it when written by himself and by another person, or when it is printed.

19. The power to recognize a letter by tracing it with the index finger or with a pencil, the movements being guided by another.

20. The power to call up mentally the appearance of an object, a figure, note, letter, or word, when word-blind.

These additional tests will aid in determining the condition of the visual word-memories in the angular gyrus, and the connection between this area and the surrounding sensory and motor areas:

21. The power to speak voluntarily, and, if impaired or lost, the character of the defect.

22. The power to repeat words after another.

23. Does the patient recognize his mistakes in speaking and writing, and can he correct them?

24. Can the patient think in speech (propositionize)?

25. Is there any special difficulty in the use of nouns, verbs, or other parts of speech?

26. The power to understand pantomime or gesture expression.

27. The power to employ intelligently gesture in expression.

28. The power to read figures and to calculate.

29. The power to count both money and in numbers.
30. The power to play a game of cards or other games.

In testing his ability to recognize objects seen, it was found that he could recognize only a few, and those were of the most familiar character, such as a pencil, book, or knife. If these objects were presented to him in rapid succession, he would become confused. At times he would recognize a watch, and at other times he would not. By the senses of hearing, tasting, and smelling, his ability to recognize was about as good as it was with vision. By the sense of touch he was unable to recognize a single object with the right hand. He could recognize a few objects by feeling them slowly and carefully with the left hand, but the process was slow and much below the normal. For all those objects that were recognized by him he had no difficulty in telling their use, but, as we should expect, he had no idea of the use of unrecognized objects.

Apraxia is a term employed to express the loss of memory for the use of things. It has been used to denote, more especially, the loss of visual memories, as soul blindness, object blindness, etc., but it is equally expressive when used to denote the loss of any of the other special sense memories.

The patient then was suffering from partial apraxia for memories of all the special senses except tactile, but for those of this sense the apraxia was complete on the right side and partial on the left.

In testing his power to recall the spoken names of objects seen, heard, felt, tasted, and smelt, the defect in this appeared to be similar to that found in testing his ability to recognize objects. With all senses, except tactile, he could recall the names only of the most familiar objects, but with tactile sense he seemed to gain no definite idea of an object with the right hand, and but little with the left.

He understood speech and sounds other than speech perfectly.

He had never known anything of music.

He experienced little difficulty in calling to mind objects named, and pointed them out when requested.

On carefully testing for auditory speech defects none were found,

On testing for 9, 10, 11, 12, of the plan followed in examining an aphasic, he made a complete failure.

On testing for 13, the power to write voluntarily, he wrote

*William Dotson
Bill al day and Jack*

Meaning to write William Dotson (his name), but the other has no meaning.

On dictating for him to write "The people enjoyed themselves," he wrote

*The people enjoyin
enjoys themselves*

I wrote and requested him to copy, "James, come home," and he wrote

*James come home
just cues cues*

Unfortunately I failed to test his ability to copy printing.

After he had learned to recognize and name "bell," "spoon," and "lamp," he was asked to write their names, and No. 4 is the result, in the order given below.



The image shows three handwritten words in cursive script. The first word, 'Bell', is written in a large, fluid hand. Below it, the word 'spoon' is written in a slightly smaller hand. Underneath 'spoon', the word 'lamp' is also written in cursive script.

17 was a failure, except for efforts under 18.

Under 18 he wrote (No. 1), getting the last part of his name correct, but "William" is wrong, although the first five letters are correct. He was able to read his name immediately after writing it, but the next day he failed to decipher it. He could not read his name when it was written by another person nor when it was printed.

19. Occasionally he could recognize a letter which his index finger was made to trace.

20. He could mentally call up the appearance of some objects, most figures and letters, and a number of words. He knew no notes.

The answers to 21 and 22 were perfect. 23. He made no mistakes in speaking. He seemed to recognize his mistakes in writing, at least, some of them, but he was powerless to correct them, and usually made a greater error when he attempted to improve his writing.

The answers to 24, 25, 26, and 27 were perfect.

28. He could read a few figures and add anything below ten, but nothing above this, neither could he subtract or divide. Before his injury he had no difficulty in subtracting or dividing.

29. He could count mentally from one to any number, but he could not money.

30. He could not play a game of cards.

The next day, July 9th, the patient went to the telephone, called for a number, and when the party answered and asked his name, he was unable to give it. He turned to the nurse, who was standing near and said, "Who am I? What's my name?"

On July 12th, the condition of apraxia proper, had entirely passed away. He had no difficulty in recognizing an object and its use, but often failed to name the most familiar objects, even after the name of the object had been given him only a few moments before. On showing him an object and calling it by various names, he made no mistake in recognizing its name when it was spoken. He was at that time suffering from a condition of verbal amnesia.

July 13th, he was asked to write to twenty. He wrote the numerals from 1 to 10, inclusive, in their regular order, omitting 11 and 12, wrote from 13 to 19 correctly, but on beginning a new line he started at 12 and wrote to 16, omitted 17, then began at 18 and wrote to 21 correctly. After writing the above figures he said that he knew what they were, but could not recall the names of them. On questioning him I found that he could give the names of a few numbers that he had just written. July 14th, he went out in the morning for a walk. With permission, was in the sun for an hour, returning exhausted. I happened to call on the hospital at the time that he returned from the walk, and found his ability to name things almost gone. He had almost no amnesia for the name of the objects, but did not know what it was. He manifested the same condition of verbal apraxia as was present on July 12th.

He was ordered to go to the sun every day, so as to see that he did not become too pale. During the time he was in the sun he was not mentally dull, but was able to do his work, though with a dull brain.

the night. July 15th, 9.30 A.M.; temperature, axillary, R., 98.2°; L., 98° F.; P., 62; R., 18. Suffering from severe pain in the head, especially in region of the operation. 9.30 A.M., felt miserable and vomited. 10 A.M., vomited again, headache agonizing. At 11.20 A.M., vomited the third time. Temperature, axillary, R., 101.6°; L., 101.8° F.; P., 70; R., 26. Bowels were freely opened with calomel. Slept one hour. 1.30 P.M., vomited again. During the remainder of the day he vomited every hour or two; headache was severe, and he was delirious much of the time; an ice poultice was kept constantly applied to the head, and he was given full doses of cannabis indica for the relief of pain. At 5 P.M. Temperature, axillary, R., 101.2°; L., 100.8° F.; P., 70; R., 26. His head was dressed, and as there was considerable prominence at the site of the operation, the wound was reopened, and a small quantity of liquid blood was let out. At 12.30 A.M. of the 16th, he was still vomiting, delirious, and suffering from head pain. Temperature, axillary, R., 101.6°; L., 101.2° F.; P., 72; R., 28. During the 14th and 15th his urine had to be drawn. At 8.20 A.M. his temperature, pulse, and respiration were about normal, but he was suffering from headache. During the afternoon the post-
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o-
cules were quite stiff, and on my attempting to turn his head forward it gave him considerable pain. On the morning of July 17th he seemed as well as he had been before the relapse, except a slight depression.

On the 18th he was asked to write a dictation, "All the girls are laughing at me." He wrote, "All boys are laughing at me." He wrote all his letters perfectly. On attempting to turn his head forward it gave him considerable pain. On the morning of July 19th he seemed as well as he had written.

On the 20th I requested him to write

He could not read a word of what he had written, but said he had intended to write and thought he had written, "Dr. Eskridge, I have been feeling very well to-day. From W. H. Dotson."

On July 23d, his letter was equally illegible, but his own name, Wm. H. Dotson, and his address, Edmond, Kan., were written distinctly. He could read his own name and address, but scarcely another word of his letter.

On July 24th, he wrote my name, his own, and his address perfectly, could read them, and was able to read a few words of his letter besides. It was evident that he recognized his mistakes. He spelt "gioel," scratched it, and wrote "girl." Some sentences were written correctly, e.g., "My giri was to see me." For "but I see that I cannot write correctly," he wrote, "but I seet I aanot were krat." In closing his letter he tried to write, "I hope you will excuse poor writing," he wrote, "I lop you nul esast pool writ," and then signed his name and address in a bold, good hand, every letter well formed, and every word correctly spelled.

Third examination July 24, 1895.

Motility, reflexes, general sensation, and all the special senses, except sight, normal. Sensation was perfect on the right side as it was on the left. The pupils reacted well to light and accommodation, and no changes were noted on examination with the ophthalmoscope. Central vision good, but a little better in the right eye than in the left. The difference in acuity of vision of the two eyes was thought to be accounted for by uncorrected refraction error. Fields: R. of each eye narrowed and amblyopic for objects; L. normal. The condition of complete hemi-

anopsia had passed away. There was no apraxia and he had no difficulty in recalling the names of objects. On testing according to the plan pursued in the examination, from 1 to 8 inclusive, were answered perfectly. From 8 to 20 inclusive, showed a number of mistakes, but they were much less numerous and slighter in degree than on July 8, and he now recognized his mistakes and could often correct many of them by a little effort. Scarcely a letter was written that did not contain an apology for his mistakes. The answers from 21 to 30 inclusive, were perfect.

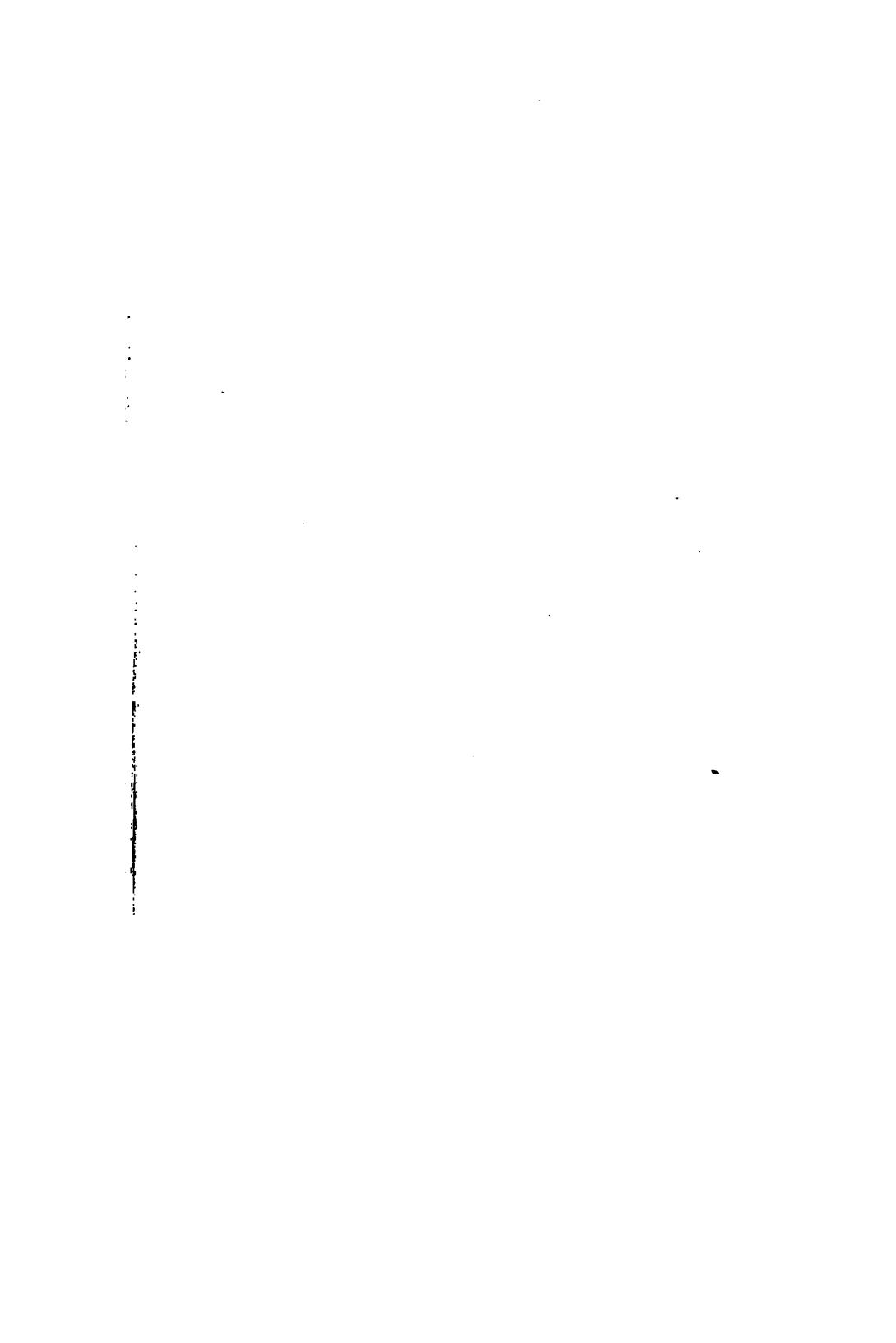
He continued to improve daily, wrote much better, but still had some difficulty in reading both writing and printing until nearly the last of August.

On the 27th of August Dr. Edward Jackson kindly examined the patient's eyes, and reported as follows:

"The ocular movements and eye grounds are normal. Both eyes present considerable irregular astigmatism, yet with correcting lenses: R. + 0.50 cyl. axis 90°, vision = 4/4; L. + 0.37 spherical, vision = 4/4 nearly.

"Taken with the hand the fields of vision are: R. normal; L. not positively diminished, but the periphery of the field is noticeably amblyopic as compared with the right, or with the normal of a healthy person."

It will be observed that neither Dr. Jackson nor I detected any "crossed amblyopia," but Dr. Jackson found the left eye slightly amblyopic in the peripheral fields.







[Reprinted from THE MEDICAL NEWS, June 20, 1896.]

**MIND AND WORD DEAFNESS AFTER DE-
PRESSSED FRACTURE OF THE SKULL
WITH SUBCORTICAL HEMOR-
RHAGE—OPERATION; COM-
PLTE RECOVERY.**

By J. T. ESKRIDGE, M.D.,
OF DENVER, COL.;
NEUROLOGIST TO THE ARAPAHOE COUNTY AND ST. LUKE'S
HOSPITALS.

FRANK P., twenty-three years of age, single, born in Bohemia, miner by occupation, was admitted into the surgical wards of the Arapahoe County Hospital on the evening of September 21, 1895. The family history, so far as ascertained, was good. The patient lived in his native land until he was thirteen years of age, when he came to the United States. During his youth he acquired a good knowledge of the Bohemian language for a man in the lower walks of life, and after coming to this country he attended school and spoke the English language almost as fluently as his native tongue. For a number of years he has worked in the coal mines of Colorado. He has been addicted to the excessive use of alcohol and occasional venereal excess: but he denies syphilis. He stated that he was never ill until the beginning of his present trouble.

On the 21st of September, 1895, in a drunken brawl, he was struck on the head just above the left ear with the butt of a revolver, or with a coupling-pin, and felled to the ground. On admission into the Hospital a few hours later he seemed dazed and confused, answered questions in English quite intelligently, but slowly. His temperature was 99.4° F. in the left axilla; 99.2° F. in the right; pulse, 80; respiration, 16. The next morning he was able to give some of the details of the injury, but by the

afternoon of the 22d he ceased to be able to speak in English, and while he used words and phrases in the Bohemian dialect, they did not convey any meaning when translated into English.

At 8.30 P.M., I was asked by Dr. Rogers, who was attending to the surgical cases of the Hospital during Dr. Parkhill's absence, to see the patient in consultation with him. His temperature remained about the same as it was at the time of his admission, the pulse had fallen to 66, and respiration was 18, but regular. There was no paresis or paralysis of any muscles, the superficial reflexes were absent and the deep reflexes were decidedly lessened. The eye-grounds were normal. The patient watched me during the examination, and seemed to realize in a confused way what was going on. When I spoke to him he appeared to hear, but would answer in Bohemian, and sometimes in English, using words entirely irrelevant, and when shown things, such as a watch or keys, he gave no evidence of recognizing them; nor did he seem to understand anything that was said to him. When told, either in English or Bohemian, to put out his tongue, he made no effort to comply with the request. The mental confusion was so great that it was impossible to determine how much of his condition was due to the localized injury in the left temporo-sphenoidal lobe, and how much to general brain disturbance.

After a careful examination I came to the conclusion that the patient could hear, but that sounds were unintelligible to him, and he did not seem to realize the use of things. There was such evidence of cerebral compression that Dr. Rogers decided to operate at once. On enlarging the wound, a depression of the skull above the left ear was found. The depressed bone was rectangular in shape, with the long axis extending from before backward and measuring in length $2\frac{1}{2}$ and in width $1\frac{1}{4}$ inches. The center of the depression was on the auri-

culo-bregmatic line. The lowest portion of the fracture was a half inch above the base line of the skull. The fractured portion was entirely detached from the surrounding bone and depressed from one-fourth to three-eighths of an inch below it. On removing the depressed bone, the membranes seemed normal, and very little extravasated blood was found. As the brain pulsated about normally, it did not seem necessary to open the dura. The base of the skull could be examined readily by the finger, and the opening in the bone appeared to be about opposite the middle third of the second and third temporal convolutions.

The patient reacted well from the operation and on the next morning desired to sit up in bed, so that restraint was required to keep him in the recumbent posture. He looked confused, and did not seem to understand questions or the use of things. When he was spoken to, he would utter one or two disconnected words in Bohemian, and not infrequently would say "yes" in English to everything. The temperature, pulse, and respiration remained nearly the same as they had been before the operation. On the evening of the 23d, about twenty-two hours after the operation, his temperature in each axilla was 100°, pulse 60, and respiration 20.

He slept quite well during the following night, and remained in about the same condition, except that the temperature fell to normal, until four days later, September 27th, when, at 2.30 A.M., he had a violent convulsion in which the trunk muscles seemed to be more affected than those of the limbs. The head was retracted and the eyes were rolled upward to their fullest extent. The convulsion lasted two or three minutes. After this the general condition was about the same as before the convulsion. He was still unable to understand any question or to communicate any of his desires to the nurse or physician. The temperature remained about one degree

above normal, but the same in each axilla. The respiration and pulse were normal. I tried repeatedly to examine into his aphasic condition, but was foiled on account of his mental confusion.

On October 4th, at 4 P.M., he had a second convolution, which was preceded by a loud cry, and when the nurse reached his bedside she found him frothing at the mouth, breathing stertorously, and eyes turned upward. The convulsive movements were general and involved all the limbs. At 11.25 P.M. he had another convolution, similar in almost every respect to the one that occurred during the afternoon.

On October 5th I saw the patient about noon in consultation with Dr. Parkhill, who had returned and was in charge of the surgical ward. Although no distinct form of sensory aphasia could be made out, it was found that he could utter sounds and words quite distinctly, and that he endeavored ineffectually to communicate his thoughts by speech. It was apparent that he heard my voice, but words to him were apparently meaningless. The ticking of a watch held to his ear, the ringing of a bell, or the jingling of coins seemed to convey to him no meaning. The words that he used, both in English and Bohemian, were so jumbled that they conveyed no meaning. He evidently could hear, even when the right ear was closed, as he looked in the direction from which sounds came, but he could not distinguish differences between the sounds of words, or differences between sounds other than words or speech. It was my belief that a lesion existed in the temporo-sphenoidal lobe, and on my recommending an exploratory incision into this portion of the brain, Dr. Parkhill decided to operate.

On exposing the dura the whole external surface of this membrane over the surface laid bare by the fracture was covered by a layer of organized lymph, at least one-sixteenth inch thick. The lymph was carefully scraped off, but

still no pulsation of brain tissue could be felt or seen. The dura was incised and the cortical substance appeared healthy except that it did not pulsate. On cutting into the temporo-sphenoidal lobe at about the center of the wound, dark, partially clotted blood ran out, and on enlarging the opening with a pair of forceps, considerable dark fluid and clotted blood escaped, together with some softened and broken-down brain tissue. The hemorrhage was entirely subcortical and involved the white substance immediately beneath the posterior portion of the first and second temporal convolutions. The wound in the brain was irrigated with sterilized salt solution and the opening in the dura and scalp were closed, except a small space which was left for drainage.

The patient remained in about the same condition for twenty-four hours after the operation that he had been in previous to it, except the right lower side of face was paretic. On the afternoon of the next day, or October 6th, the nurse asked him to turn over in bed and at the same time made a motion in which direction she wanted him to turn. He obeyed her request. In the evening when shown a watch he said "One-half past." The watch at the time indicated 6.30 P.M. He could not be gotten to tell the hour. October 7th, 11.30 A.M., I found that he could read aloud, but could not pronounce long words, nor did he seem to understand what he read. The right side of the face was slightly paretic. It was impossible to get him to protrude the tongue, as he did not seem to understand what was wanted of him, even when I wrote the request and then protruded my own tongue. He seemed much brighter, and when I showed him my watch, which indicated 12.15, he said, "It's exactly a quarter of an hour." When the minute hand had reached the even hour I again showed him the watch, but he seemed to be unable to tell the time of day. When the watch was first shown him he said "pretty

fine," and when it was placed against his ear he said "going pretty well." When he was given asafetida to smell he said "pretty bad," and on giving him milk to drink he said "good," but he did not seem to understand anything that I said to him. He was evidently word deaf, but not word blind, as he could read slowly quite well, although he did not appear to appreciate what he read.

It was difficult, or almost impossible, to determine whether he recognized objects presented to him by the various senses, as he did not seem to be able to read understandingly. Besides, the local injury to the temporo-sphenoidal lobe, he was suffering from the general effects of traumatism of the head. He could not be induced to name any object, but he appeared to know the use of some objects, as evidenced by his answers when a watch was shown him or placed against his ear (left one). Spoken words had no meaning to him. He read slowly, but distinctly and connectedly, writing and printing, but it was doubtful whether he understood what he read. He made several ineffectual voluntary attempts to write, but could not combine the letters so as to make sense, although he could form the letters well. He could copy single words and read them, but would attempt nothing more, as he seemed to be exhausted. He could not write from dictation, because he could not understand what was said to him. It was observed that he never spoke voluntarily. The right side of the face was still paretic.

On the 8th he was able to recognize letters and call their names, and to write figures and read them. He was able to add two and two, but could not multiply. When shown playing cards he simply called them by the number of spots on them. When shown king, queen, and jack he said one. Cards did not seem to make any mental impression upon him except of number. He was unable to recognize a letter when it was traced with his finger.

Re-examination of the eyes showed fundi entirely normal. It was impossible to test the visual fields. The right side of the face was more paralyzed than it was a day or two before, but he now protruded the tongue in the median line.

October 9th remained in about the same condition.

On the 10th he understood what was said to him and repeated a few words. If a thing was held up and a name suggested, he assented to it, giving assent to all names, the wrong name as well as the right one. When asked how he felt he said, "Better." Have you headache? "Yes, a little." Where? He put his hand to the left side of his head. What is your name? "Frank Pezel." He was able to name a watch and tell the time of day. The right side of face is more paretic than it was yesterday, but he is able to protrude the tongue in median line.

On October 11th I made a prolonged and systematic examination to determine the degree and character of the aphasia. This was the first day that his mental condition appeared sufficiently clear to make such an extended examination possible. It was impossible to determine whether he recognized all objects seen. This power existed for the most familiar ones. On testing his power to recognize objects presented to him by the other senses, varying degrees of apraxia were found present for some. When a watch was placed against his ear he recognized it at once. On covering his eyes and allowing him to feel objects, he became confused. The senses of smell and taste did not seem to convey to his mind as definite impressions as those of hearing and sight. Some things he used correctly and others wrongly in feeding himself.

His power to recall the names of objects presented to him, by the various senses was defective for many things. By the sense of sight he could recall the names of all familiar objects, such as pencil, coins, watch, knife, to-

bacco, etc., but those less familiar such as book, scissors, needle, spool, pin-cushion, etc., he frequently made blunders in trying to name them. Watch and coins he recalled the names of when he heard them, but bell and keys were sometimes wrongly named. He made many mistakes in naming objects presented to him, by the senses of feeling, tasting, and smelling. Tactile sense seemed to convey to his mind the least definite impression of all the senses. He understood sounds other than speech better than those of speech, and rarely made a mistake in interpreting familiar sounds. His power to understand speech was very imperfect. He showed no apparent intelligent appreciation of speech, except in a few direct questions that related to his own condition, such as "What is your name? Have you headache? Are you hungry?" etc. To every other question or request he would answer "German." He manifested no appreciation of music. It was learned later that he had never known anything of music. He was unable to call to mind objects named, and consequently could not point them out. He invariably recognized his own name when it was spoken, but other names, such as nurse, doctor, etc., he did not recognize unless they were repeated over several times. He did not recognize a word spelled aloud. So far as I was able to determine, he could not call up mentally the sound of a note, figure, letter, or word, but on this point I could not be certain as it was difficult to get him to comprehend what I desired.

He recognized figures and letters, pronounced words shown him, could read printing and writing aloud, but did not seem to understand what he read. He was unable to recall the objects the names of which were seen. When given a pen and requested to write, he wrote his name, but could not be induced to write anything else. He attempted to write every time that he was requested, but after hesitating a while, his name fairly well written

was the invariable result of his effort. He could not write at dictation. He wrote from copy, quite well, both printed and written, and converted printing into script.

In testing his ability to write the names of things seen, heard, felt, smelt, and tasted, he wrote the name of only one. This was whisky. He was shown a pencil, and requested to write its name. He shook his head. He was given sugar to taste, cologne to smell, a pencil to feel, and a watch was held against his ear, but he did not attempt to write the names of any of them. When whisky was presented to him by any of his senses, it invariably caused him to smile, and immediately on my requesting him, he wrote the word "whisky." He read aloud what he had written, but evinced no evidence of understanding what he had written except the word "whisky," and possibly his own name, although it was by no means certain that he understood what it represented. It was learned afterward that he was very fond of whisky. He could not apparently recognize a letter when his index finger was made to trace it. His mental condition was such that I could not determine whether he could mentally call up the appearance of a figure, letter, or word.

There was no defect in voluntary speech except that it was slow. He could repeat words after another, provided they were uttered very slowly. There was a tendency with him to repeat the first word of a sentence two or three times in repeating a sentence after me. The patient recognized some of his mistakes in writing, but seemed unable to correct them. There appeared to be no special difficulty in the use of nouns, verbs, or other parts of speech. He understood and used gesture expression in speech. He could count, both money and in numbers. He was unable to play a game of cards. He did not seem to be able to recognize differences between cards, but when different cards were shown him he called out the number on the card, and all were spades to

him. After he recovered he showed quite a fondness for various games with cards. There was no defect in the field of vision. Sensation was perfect throughout the body.

On October 15th he manifested no difficulty in recognizing objects and their uses. He quite readily named most objects presented to him through the different senses. The only trouble apparent in understanding speech was that the first word or words of a sentence appeared to make the most impression on his consciousness, and these would be repeated two or three times. He read printing and writing quite well, but did not show a comprehensive appreciation of what he had written. He could recall the names of most objects presented to him and wrote them. He wrote at dictation imperfectly, as the first word or words of a sentence were repeated several times in writing a sentence. He understood cards and played games with them.

October 22d, no appreciable defect in speech. He said that he did not fully realize where he was and what had happened until a few days ago. He did not remember that he had seen me, and that I had examined him prior to October 15th. He said when he fully regained consciousness that he found he could not speak as formerly in Bohemian. Before his injury he had spoken as well in Bohemian as in English, but now it was quite difficult for him to think in his mother tongue.

Throughout the period of his illness, beginning September 21st, and ending about October 15th or 20th, his temperature was practically normal, and equal on the two sides of the body, except on the occasions noted in the clinical history just given.

The points of special interest in the above case are, the localizing value of the aphasic symptoms, the external pachymeningitis and convulsions, the mind and word deafness, and the partial loss of the language

which he had first learned, and which he had used exclusively for the first thirteen years of his life.

On September 22d, when I was asked by Dr. Rogers to see the case with him, by the auditory defect of speech alone, before the wound was exposed, the lesion was located in the first and second temporal convolutions. On finding a depressed piece of bone lying against these convolutions, without any extravasation of blood, it was thought probable that there was no deeper lesion. Still the auditory speech disturbance did not improve. A few days later, when the general convulsions began, it was decided by Dr. Parkhill to reopen the wound. On exposing the dura and finding it covered with recent exudate, partially organized, this seemed to be sufficient to give rise to the convulsions, but I argued that the pressure from this was not great enough seriously to interfere with the function of the temporal convolutions. After the dura had been cleansed and incised, no exudate was found on the internal surface of this membrane, and no cause for pressure on the cortical substance of the brain was discovered. It became evident that there must be some subcortical lesion to account for the mind and word deafness. The pulsation of the brain was just apparent, but very feeble. At my request Dr. Parkhill cut into the brain substance and exposed dark, partially clotted blood. After this, when the broken-down brain substance had been removed, improvement became apparent as soon as the effects of the anesthetic had worn off, and two or three days later the mind deafness had greatly lessened, and soon disappeared entirely. The word deafness, on the other hand, remained for at least three weeks longer. Auditory speech disturbances as localizing symptoms will be discussed at greater length in the summary which is to follow the report of this series of cases.

How are we to account for his failure of memory for

his mother tongue to a greater extent than for the language that he had acquired after his thirteenth year? In amnesia it is found that memory fails most for things recently acquired, and for those that were learned at more or less remote periods it may be well preserved. In senile dementia the incidents of early childhood and youth may be remembered with great vividness, and prattled about by the dement, yet he may not be able to tell what he has eaten an hour before. In the delirium of fevers, persons, who are foreign born and who may not have had occasion to speak their native tongue for years, will speak exclusively in the language of their childhood. The manner in which memory fails is so invariable that in a case of suspected feigning of amnesia, if recent events are well remembered and the mind is a blank for things learned in early life, we do not hesitate to pronounce the suspect an impostor.

Is this case, then, an exception to the rule? I think not. During the patient's delirious state he talked almost exclusively in the Bohemian language, and only used the English after the receipt of the injury, during the time intervening between this and the development of the delirium, and again as the delirium began to subside, English was substituted for the Bohemian. It was not until several days after recovery appeared complete that he volunteered the information concerning the difficulty he experienced in thinking in his mother tongue. On inquiry I found that during the five years he had been in Colorado he had not had occasion very frequently to speak the Bohemian language, and from his thirteenth year up to the time he had come to Colorado he had spoken Bohemian only at home, and English with his playmates and school companions.

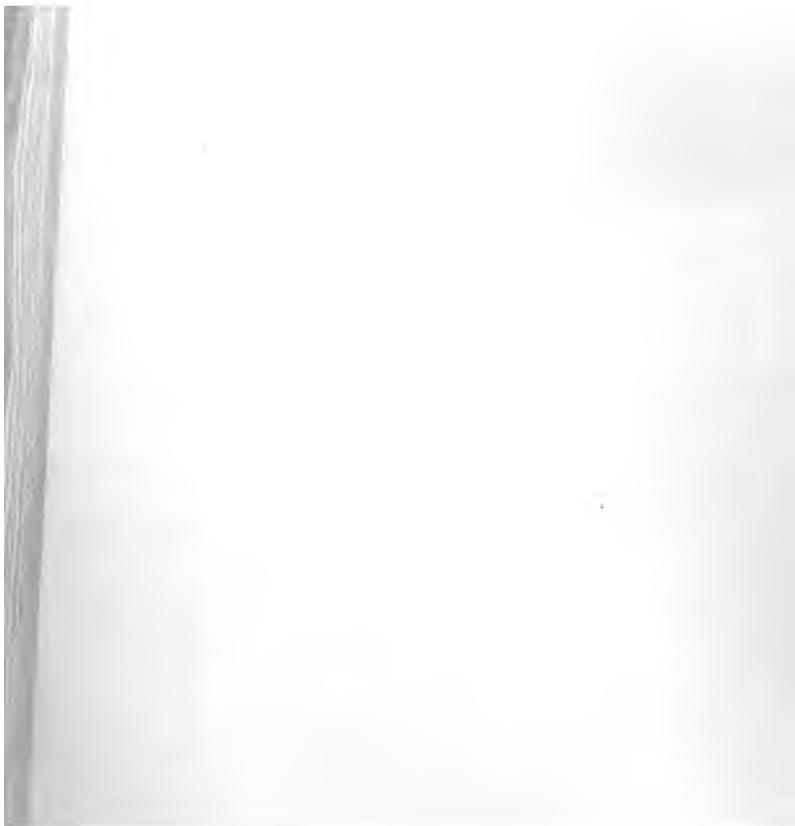
The facts are these, in his normal condition, he could talk best in that language which he used most, and for a number of years had employed almost exclusively, but

in his delirious state the brain-cells reproduced from the memories made upon them when they were most impressionable. The injury to his brain had left him weak, and voluntary recollection was best for those things with which he was most familiar at the time.

While his condition of memory impressed me as being peculiar at the time he volunteered the information concerning it, yet on reflection all mystery disappears.

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[Reprinted from THE MEDICAL NEWS, July 11, 1896.]

*GLIOMA OF THE LEFT CENTRUM OVALE,
MONOPLEGIA, HEMIPLEGIA, WORD-
BLINDNESS, ALEXIA, AGRAPIA,
PARTIAL APRAXIA AND COLOR-
BLINDNESS; OPERATION,
IMPROVEMENT.*

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W. D. M., aged thirty-eight, born in Ohio, practising physician since 1882, married, living in Colorado at an altitude of about five thousand feet five years, was referred to me by Dr. Parkhill. He complained of speech disturbance and paralysis of the right leg and arm.

Father died from rheumatism, at fifty-seven years; mother is in good health. Has three brothers and four sisters, all well and strong. No consumption, mental nor nervous diseases in any of his relatives.

He has enjoyed excellent health. Has never had rheumatism, and denies any venereal disease. His habits have been excellent. As a young man he worked very hard. He has a magnificent physique, is bright and intelligent, and is said to be a good classical scholar. During the summer of 1892 he suffered from a severe attack of indigestion, which lasted six weeks and at this time he was compelled to give up work. His health was soon almost as good as before his sickness, except that he was inclined to be constipated and had to be more careful of his diet.



wrongly. His only symptoms when he left Denver for Texas were paralysis of the right arm and speech disturbance. During the journey there, extending over a period of three days, his right leg became very weak, so that he was unable to dorsally flex the right foot to its normal extent, and soon was forced to drag the right foot in walking. The whole limb felt cold and "dead." During November and December, his leg was worse, but arm and speech remained about the same. Some time in November he began to have great difficulty in dressing himself, and would at times put his clothes on with the inner side outward, reverse his shoes, and get his vest on over his coat. In December, 1894, the right shoulder, arm, and hand became hyperalgesic to such an extent that the least rough usage of these parts caused intense suffering. This condition remained about three months, then these parts felt cold and numb. During his stay in Texas he suffered for two weeks from severe headache. With this exception there had been no headache before he consulted me. The difficulty in dressing himself became so marked that his wife joined him January 10, 1895. Soon after that time he began gradually to improve, and a month or so later he could raise his right hand to his head, walk fairly well and utter a few simple words. In March, 1895, he walked eight miles one day. During that month he traveled alone from Galveston to Iowa, where he remained until May 1, 1895, and slowly improved. On his return to Colorado he could utter the principal words of a sentence, and at times could make himself understood. He employed and understood gestures. He could not use his right hand at all, but he could raise this hand to his head. His right leg had almost completely recovered. The only trouble observed was a tendency to let the front of the foot fall in walking. He learned to ride a bicycle and rode long distances without much difficulty. During June his speech became much worse and

he had to give up riding the bicycle on account of the weakness of the right leg. From December, 1894, to June, 1895, he felt dazed.

At present he feels quite well, but has little power of endurance. Is unable to form sentences or to write. He understands everything said to him and can count money. His memory is good. He can sing all the tunes that he knows, and can repeat, in a fair manner, short verses of poetry or a few lines of prose learned when he was a child. There is no vomiting, dizziness, headaches, or convulsions. He complains of no disturbance of the special senses, but thinks his taste was blunted last winter. His physical condition in regard to muscular development and the presence of fat seems excellent, although he is ten pounds lighter than he was before the beginning of his present trouble. He has a dazed and confused feeling when he gets tired. He sleeps well and does not get drowsy during the day as he did a year ago. When he is in the recumbent posture he talks better than he does when he is sitting or standing.

July 12, 1895. Gait is slow and halting. He drags the right foot and the toe of the shoe is greatly worn as the result. There is no distinct ataxia, besides a little jerky and uneven movements of the muscles on voluntary motion, in the leg, arm, or trunk muscles. If there is any ataxia of the right arm it cannot be distinguished, as its muscles are so nearly paralyzed.

Muscular Power.—Right leg, plantar flexion fairly strong; dorsal flexion very weak, and he is unable to bring the foot at right angles with the tibia. There is a slight contracture of the plantar flexors. Knee and hip muscles are weaker than those of the left leg, but still are fairly strong. Left leg muscles normal. Arms: Dyn. R. 18; L. 166. There are flexor contractures of all the fingers of the right hand, upon the hand, of the hand upon the forearm, of the latter upon the upper arm, with



quite firm adductor contractures of the upper arm against the chest. The contractures of all the muscles can be overcome by force without giving rise to pain, except those that adduct the arm. The tongue deviates slightly to the right in extreme protrusion, but not if only moderately protruded. The right lower side of the face is paretic, so that voluntary motion is lessened, but as seen in smiling, emotional motion is not perceptibly affected.

The muscles of the thenar eminence and the interossei muscle of the right hand are the only ones that present a wasted appearance. These are considerably atrophied, but respond about normally to the faradic current.

Reflexes.—Knee-jerks; R., enormously exaggerated; L., considerably increased over the normal. Both influenced by reinforcing. Ankle-clonus: R., present; L., absent. Tendo-Achillis: R., exaggerated, with marked clonus; L., increased. Plantar absent. Cremaster: R., absent; L., well marked. Abdominal reflexes absent. Extensors of forearms: R., greatly exaggerated; L., about normal. Biceps: R., exaggerated; L., slightly increased. Triceps about the same as the biceps. Deltoid: R., well marked; L., absent. Pectoralis major: R., pronounced; L., absent. Masseter absent. Pharyngeal and iris reflexes present. Sensory phenomena: Right side. Tactile sense is present throughout this side, except on the distal portions of the fingers, where a camel-hair pencil cannot be perceived, even when it is in motion. Throughout this side, but more marked in the distal portions of the leg and arm the sense of touch is blunted. Localization is perverted and lessened everywhere, and almost completely lost on neck, trunk, arm, and leg. When the right hand and foot are touched he not infrequently refers the impression to the corresponding part on the left side. Temperature sense is lessened in face and nearly absent in parts below the face. Pain sense acute throughout the entire side. Posture sense apparently present, although

his speech difficulty makes it impossible to be absolutely certain in regard to this point. Muscular sense absent. Pressure sense uncertain. Joint sense seems to be present. All general sensory phenomena normal in left side. Smell and taste present and equal. Hearing; watch, R., 2/3; L., 2/3; tuning fork test not reliable, and he gets excited and confused in trying to understand what I want, and in endeavoring to make me understand his impressions.

Eyes.—Vision: R., 20/30; L., 20/30; fields normal; all the external ocular muscles act well; pupils equal in size and respond readily to light and accommodation. Fundi normal.

Mental Condition.—Early in the examination his mind appeared quite clear, but as soon as he became fatigued he at once showed evidence of mental confusion. Further examination was deferred until he was rested.

Speech.—Most of the objects that he sees he recognizes at once, but those less familiar to him seem to confuse him. When objects are presented to him by hearing, taste, or smell, he recognizes the familiar ones as readily as when he sees them. On the right side tactile sense is too dull to enable him to recognize objects by feeling them. On the left side certain qualities are readily appreciated by tactile sense.

He appears to know the use of all familiar objects, so far as he is tested. He is unable to recall the spoken names of objects presented to him through any of the senses, but for most familiar objects he recognizes the name of each when it is repeated. Not infrequently, however, especially if he is a little fatigued, he becomes confused about the names of objects that are very familiar. There is a condition of verbal amnesia for the names of familiar objects and probably apraxia for those less familiar. When he is blindfolded and called by his wife, he smiles and says, "That's all right, but I can't

say it, no." He means that he knows who is calling him but he cannot recall her name.

He understands sounds other than speech and speech and music. He is very fond of music and is said to have been quite proficient in it. He has no difficulty in singing a familiar tune if his wife will lead, but he cannot be gotten to start and sing a tune unassisted. He promptly calls to mind the objects named and points them out. He has no difficulty in recognizing and pronouncing a word spelled aloud, and he can call up mentally the sound of a note, figure, letter, or word.

He is unable to recognize a note, rarely a letter, but occasionally he recognizes and even calls the names of some figures. He is totally unable to understand most printed and written words. He recognizes his own name, points to himself and says, "that all right." He is unable to read printing, writing, or music, either aloud or inaudibly.

In a few instances only can he recall an object, the name of which is seen. This power is retained for a few of the most familiar objects, the names of which are short, such as dog, cat, rat, book, longer names of equally familiar objects give him no idea of the object, *e.g.*, matchbox, penknife, handkerchief. Less familiar objects with short names are not recalled by seeing their names, *e.g.*, parrot, grouse, quail.

On testing his power to write voluntarily, his name fairly well written with his left hand, is the only result. After he writes his name at the first attempt, I tell him to write something else. He hesitates a while, and again writes his name. This is repeated several times. He cannot write at dictation. He copies fairly well with his left hand, the right being completely paralyzed, but the copy is made mechanically, writing appearing as script and printing as printing in the copy. Each letter received the degree of shading found in the original. He cannot write

the names of any objects presented to him by any of the special senses, and does not know what he has written when he copies, except it be his own name. He can write his name voluntarily, and at dictation, and can read it when written by himself, by another person or when printed.

Generally he does not seem to be able to recognize a letter or figure when his left index finger or hand is made to trace it, but sometimes he would say, "all right," meaning he knew, but on questioning him if he were sure, he would wave his hand in front of his face, meaning that he was confused or uncertain.

In testing his power to call up mentally the appearance of an object, a figure, note, letter, or word, it is impossible to determine accurately the extent of the defect, as he sometimes says "no" when he means "yes," and *vice versa*. He does not seem to have any difficulty in mentally calling up the appearance of objects, but for those of figures, notes, letters, and words there is a grave defect.

Voluntary speech is much impaired. If he is asked to say something he will simply say "It's all right," then smile at his failure, or look vexed and say "Oh pshaw!" At times he endeavors to make his wants known by speech. He will utter one or two of the principal words of a sentence, make a few gestures and look anxiously for some one to complete the sentence for him. If the wrong word is supplied he immediately rejects it, but when the right one is suggested he accepts it with an approving smile. The defect in voluntary speech is due to verbal amnesia.

He can repeat long and difficult sentences after another if one word is uttered and he is allowed to repeat it before the second one is spoken. If several words of a sentence are uttered he will say one or two of the principal words, but will leave out the articles, pronouns and adjectives, etc. The defect in repeating words after another appears to be due to his inability to remember more than one or

two words at a time. If he is asked to repeat a word over several times and told to try and remember it, five minutes later it is found that he has entirely forgotten it.

He recognizes many, but probably not all, of his mistakes in speaking or writing, but is powerless to correct them. If his mistakes in speech are corrected for him, he recognizes and appreciates it. If his mistakes in writing are corrected for him, he does not recognize it, but accepts it by saying "Don't," or "Don't know," or "All right."

The patient has no difficulty propositionizing or thinking in speech. There is no special difficulty with one part of speech more than another. His memory for nouns or the principal words of a sentence is better than for the less important words. He understands and employs gesture expression in speech.

He cannot read figures or calculate, neither can he count in numbers. He recognizes money and succeeds in making change. He cannot play a game of cards.

All the internal organs, except the brain, were apparently normal.

After completing the examination I concluded that the doctor was suffering from tumor of the brain, which was large and rather diffuse in character, and that it was situated in the left cerebrum, subcortical, at least in its early stage, to the angular and Rolandic regions. I advised as the only hope, an early operation for its removal, but requested him to go to the St. Luke's Hospital and let me study his case daily for a while before submitting to an operation. He accepted my diagnosis without hesitation, and gave me to understand, aided by his wife in communicating his wishes to me, that he would follow my advice to the letter.

His wife further stated that her husband had been convinced for some time that he was suffering from tumor of

the brain and had desired to have it removed, but physicians and relatives had opposed such a procedure.

He entered the St. Luke's Hospital, July 13, 1895.

Careful temperature observation of the heat of the mouth and the two axillæ were made several times each day, together with a record of the pulse and respiration. I desire, in this connection, to acknowledge my indebtedness to the intelligent coöperation of the pupil nurses in the training school of the Hospital, for the careful and efficient manner in which they made observations for me. I personally made several comparative surface temperature observations of the head on several different occasions, and from time to time verified the accuracy of the axillary and mouth temperatures taken by the nurses. In all the temperature observations the Fahrenheit scale was used. July 13, 7 P.M. axillary temperature, R., 98.2°; L., 98.2°; P., 78; R., 22. Head: temp., temporal; R., 94.8°; L., 95.3°.

July 14, 7 A.M. the axillary temperature was 97.3° and practically the same on each side; pulse and respiration about the same. It was observed that he got his shoes changed in putting them on, and he did not seem to be able to correct his mistake without the assistance of the nurse. At noon, temperature, axillary: R., 97.2°; L., 97.3°; mouth, 97.8°; P., 68; R., 20. Head temp.: Temporal: R., 96.2°; L., 96.6°. Mid-Rolandic: R., 96.1°; L., 96.5°. Parietal eminence: R., 96°; L., 96.2°. During the remainder of the day the record was practically the same.

July 16, 6.30 A.M.: temp. mouth: 97.2°; axillary: R., 96.6°; L., 96.8°. Pulse and respiration unchanged. It was observed on that day that the fields in the right lower quadrant of each eye were a little contracted.

During the next four days temperature was not above normal.

July 18, the following notes were made. "All the

movements of the right foot and leg are fairly strong, but they are slow and awkward, especially at the ankle. Right shoulder movements are strong, but these also are slow and awkward. He cannot rotate the right forearm, move the thumb or any one finger of this side separately. Thumb remains almost motionless, even when he attempts to move it in association with the fingers of the hand. He can slightly flex the fingers of the right hand, when all the fingers are allowed to move at the same time, but it requires an extraordinary effort on his part to do this, and it is attended by movements of the right elbow and shoulder, and flexor contraction of the fingers of the left hand. Right foot and hand are cool and dark from venous stasis.

The Rolandic region, the greater portion of the parietal lobe, especially the inferior parietal lobe and the angular gyrus of the left side, all seemed to be involved by the lesion. It was thought that a trephine opening through the skull just below the parietal eminence would expose the center of the morbid process, which was thought to be a tumor. The operation and surgical aspect of the case will be found described by Dr. Parkhill.

After I had satisfied myself that the patient was suffering from some organic brain lesion and not from a mere hysterical or functional condition, the further differential diagnosis seemed to lie between a vascular lesion and abscess or tumor.

The absence in the history of the case of all evidence of apoplectic or apoplectiform symptoms inclined me to regard the case of non-vascular origin. The gradual onset of the symptoms beginning in the right hand, later affecting the forearm, upper arm, and shoulder, and finally involving the leg of the same side, is contrary to what we find to result from vascular lesions. A small area of softening may take place from the occlusion of small vessels and later by the occlusion of other vessels, the area of

softening may extend and involve adjacent centers to those first affected, but in such cases there is a history of slight apoplectic attacks.

There was no detectable cause for abscess of the brain. Besides when a cerebral abscess becomes extensive enough to produce hemiplegia, the brain function is so interfered with that life, as a rule, is prolonged only for a few weeks at most, and generally only for a few days. Decided improvement in such cases rarely, if ever, takes place, and if it should occur, it would not be maintained over a period of months.

I was forced to the conclusion that I had a tumor to deal with. Could the symptoms be accounted for by the presence of a tumor?

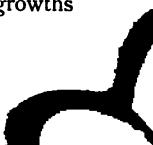
A tumor in the centrum ovale, in which intracranial pressure is not much increased, may be unattended by optic neuritis, headache, nausea, vomiting, vertigo, and convulsions, and its presence may be suspected only when fibers of the corona radiata are involved, the connection of which is with more or less definitely known centers of the cerebral cortex. The gradual development of the symptoms, beginning in the distal portion of a limb and extending toward the body is a common occurrence in intracranial tumors, situated in the cortex or immediately below it. Rapid development of symptoms, after the disease has existed for some time, followed by periods of weeks or months during which the disease does not advance, but may retrograde considerably, occurs in some vascular growths, especially of the sarcomatous and gliomatous varieties. There did not seem to be any symptoms that could not be accounted for by the presence of a growth in the centrum ovale. The history of the case indicated that the growth was a glioma or sarcoma.

THE SURGICAL ASPECT OF THE CASE.

BY DR. PARKHILL.

On July 19, 1895, preparation was begun for the surgical side of the above case. The scalp was shaved, measured, and the markings made permanent by nitrate of silver solution. The scalp was then scrubbed with soap and water, with ether, and finally with a solution of mercuric chlorid. Dressings wrung out of these mercurial solutions were then applied, to be left until the time of operation. He was given a purgative of epsom salt on the evening of the 19th.

The operation was begun at 11.30 on the morning of July 20th. The markings of the scalp were transferred to the bone by the Parkhill skull marker. The scalp was then raised and a button of bone was removed just posterior to the arm center in the left Rolandic region. This opening was enlarged with rongeurs, until it had a diameter of about an inch and a half. The bone proved to be quite vascular and hard and had about the normal thickness. The dura was then opened by a crucial incision. The underlying membranes seemed normal. There was no pulsation and the brain was much more firm and resistent to the touch than normal. The exposed surface was of a dirty, yellowish color. It then became apparent that the tumor had a greater area than the bony opening, so this was enlarged until it had a diameter of about two and a half inches. The membranes were also opened to a corresponding degree. The tumor was cut away piece-meal, with a sharp Volkman spoon. It was quite firm and tough. The yellowish discoloration which was perceptible on the surface was found to prevade the entire mass. Its limits were made out only by lessened resistance to the instrument and a change to normal color. Some embarrassment was encountered from hemorrhage, but not more than is usual in the removal of such growths



and it was rapidly controlled by plugging and slight pressure, by means of sterilized gauze. This growth approximated a circle, having a diameter of about two inches and extended to a depth of about three-fourths of an inch.

The membranes were reunited with catgut, except at the most dependent point through which a small rubber drainage-tube was inserted, and this was brought out through the middle of the scalp flap. The scalp was sutured with silkworm-gut, the usual dressings applied, and the patient returned to his bed, the operation having occupied something less than an hour.

The patient exhibited considerable shock for the first few hours, his axillary temperature dropping as low as 96.8°. It had risen, however, to 98.3° at 6 P.M. He was stimulated by alcoholics and heart tonics for twenty-four hours. His recovery, from a surgical standpoint, was entirely uneventful. His temperature fourteen hours after the operation reached 100.6°, but dropped to 99.6° at the end of eighteen hours, which was never exceeded afterward.

On March 22, 1896, seven months after the patient had left the hospital following the removal of the tumor, I lifted the scalp over this area, dissected it away from the dura, and inserted a piece of gold foil the size and shape of the bony opening. This was dressed on the sixth day and found perfectly sound, and the patient was sent home.

SUBSEQUENT HISTORY OF THE CASE FROM THE
STANDPOINT OF THE NEUROLOGISTS, WITH RE-
MARKS.

BY DR. ESKRIDGE.

Angust 7, 1895, eighteen days after the operation, I first examined the patient. His condition then was nearly the same as it had been before the operation, except that the right leg, especially at the distal portion, was weaker. He could, however, read a few words and point out most

objects, the names of which were spoken. The optic disks and ocular fundi were normal in appearance. The fields were well preserved, except a slight narrowing of the right lower quadrant of each eye. Central vision was good.

October 17th he was again examined. The paralysis, especially of the face and leg, were decidedly less than before the operation. He was able to count money and to make change. He did not seem to be able to recognize colors. His speech was a little better.

October 28th, at 3 A.M. he had a general convulsion. The night before he had eaten heartily of pumpkin pie and had been constipated for three days. The right hand began to jerk, he screamed and a general convulsion, involving both sides of the body occurred. The left side was less affected than the right. During the convulsion and for an hour or two after it, the soft parts were protruding through the opening in the skull and were pulsating. After his bowels had been thoroughly opened by an enema, he regained consciousness, the brain receded and all visible pulsation ceased.

November 19th, the doctor drove from Longmont to Denver, a distance of thirty-four miles, without being fatigued. He was much improved physically and mentally appeared clearer. His wife stated that he had been trying for some weeks to read the papers, and was frequently able to tell some things that he had read. On my testing him I found that he did not know a letter of the alphabet. While riding along the road he repeatedly pointed out objects and spoke their names, *e.g.*, "Hello, a Jersey calf." He was still able to pronounce any word that was spelled aloud for him. He was beginning to regain some voluntary speech, and could recall some objects, the names of which were seen. He could recall all objects, the pictures of which were seen, and often name them. He could read and pronounce the word

"box" and pick out a box from several objects on the desk, yet he could not recognize a single letter employed in spelling the word. He could count money readily, but could not count by numbers. It was observed that words called up ideas, *e.g.*, "river" he called "water"; "Paris," "France"; "Council Bluffs," "Iowa." Of late he has been able to play games, both with checkers and cards.

The muscular rigidity was very much less; the knee-jerks were nearly normal; ankle-clonus was absent; deep reflexes of right arm still very much exaggerated; he could pronate and supinate the right forearm, and raise the arm without assistance above the head. The next day he came into my office alone; I asked him where his wife was. He promptly replied "trading," meaning shopping. Dr. Charles F. Andrew, of Longmont, Col., kindly made observations from time to time for me. He found that the patient could not sing a tune unless it was started for him. In trying to whistle a tune he would get the wrong one, but would recognize his mistake. On December 20th, he still had great difficulty in recognizing colors.

January 3, 1896, Dr. Andrew found the fields of vision normal, and the central vision good. His color sense was much impaired. He could calculate and count into the hundreds. He read a number of words, but recognized only one letter of the alphabet, "a". He recognized six out of nine numbers written. During the first week of January, while his stomach was out of order, he had his second convulsion, similar in every respect to the first.

March 8, 1896, he was examined again. Muscular power in the right hand had improved a great deal. Dyn. R., 50; L., 170. Contractures and deep reflexes were lessened. He walked fairly well and was able to harness and unharness his horse. He could drive long distances

without becoming fatigued. Localization sense was greatly perverted, or nearly absent throughout the right side, except in the face. Tactile sense was present, but lessened. Temperature sense was absent throughout the right side, except in the face. Cold substances were called hot, and hot substances (temperature of 120°) were scarcely felt. Pressure sense greatly lessened; joint sense present; pain sense was lessened, but not abolished. Posture and muscular senses were absent in right arm. Hearing, smell, and taste showed no change. He had improved some in speech, especially in repeating longer sentences than he had been able to do before the operation. Voluntary speech was a little better, but he was still completely letter blind, word blind, for all words except very familiar ones. He was unable to write voluntarily, and had made very little progress in learning to read.

On March 11th, he had his third convulsion.

On consultation with Dr. Parkhill, it was decided to raise the scalp and insert gold foil between it and the dura, as it was feared that adhesions had formed between these and caused the convulsions. Firm adhesions were found between the scalp and dura.

As all the convulsions have begun in the right hand, and firm adhesions were found between the dura and scalp over the center for this hand, it is probable that the insertion of the gold foil will prevent the irritation which gave rise to the initial convulsive movements.

The result in this case, although a complete cure cannot take place, is encouraging toward further and earlier operations for the removal of tumors of the brain. The tumor was thought to be quite large before the operation, but it was hoped that an encapsulated sarcoma would be found, instead of an infiltrating glioma. Had the enormous size of the tumor and its infiltrating character been known before an attempt was made to remove it, it is very probable that an operation would have been discouraged.

After the operation the wife was told that there was little to be hoped for, as the tumor would in all probability return. At the end of ten months improvement still continues, and there is no evidence that the growth has returned. In such cases, even if no better results can be obtained than has been achieved in this one, the outcome fully justifies an attempt to remove the growth. A person in the patient's present condition is able to enjoy life.



1

[Reprinted from THE MEDICAL NEWS, Aug. 1, 1896.]

**CYST OF THE BRAIN IN THE FOOT OF THE
LEFT SECOND FRONTAL CONVOLUTION;
MOTOR AGRAPHIA (?) FROM INABILITY
TO SPELL; EVACUATION OF THE
CYST; IMPROVEMENT; TRAU-
MATIC MENINGEAL HEMOR-
RHAGE TWO MONTHS LA-
TER; SECOND OPERA-
TION; RECOVERY.**

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GUARDS.

MR. W. E. F., white, aged thirty-four, born in Pennsylvania, married, stock raiser by occupation; resident of Colorado nineteen years, first consulted me April 18, 1895. Father is living and well, mother was subject to "sick headache," and died of "brain fever"; two brothers are living and in good health, except that they suffer from "sick headache"; one aunt is also similarly affected. There is no epilepsy, consumption, insanity, or alcoholism in the family.

The patient as a child was strong and rugged. At his twelfth year he suffered from an attack of measles. At the tenth or twelfth year he began to be subject to severe

headaches. They would occur every two or three weeks and pass off after several hours' sleep. The attacks seemed to be brought on by exposure, exhaustion, overeating or some indiscretion in diet: The pain came on suddenly, was sharp, dull or aching in character, and located chiefly in the right temporal region. After several hours, the patient would vomit one or more times, fall asleep and awaken free from pain. As maturity was reached the attacks lessened in frequency and severity, and during the last five years he has experienced only a few seizures each year, the number depending apparently upon irregular habits and indiscretions in eating. He has not been addicted to frequent or excessive use of alcohol. During his twenty-second year, subsequent to exposure to cold, he suffered from severe pain in the left ear. Ten days after the pain commenced, a purulent discharge began from the external auditory meatus of this ear, and continued for three weeks. Six years later he had an attack of la grippe, which was followed by a purulent discharge from the same ear, that ceased after two weeks. Since then his hearing has been lessened in the left ear, and he occasionally experiences a throbbing sensation in it. Five years ago he contracted syphilis, but no secondary symptoms followed. The patient has suffered from indigestion for some years. The symptoms of this have been heartburn, pyrosis, eructations of gas, and distress after eating.

In 1892, one year after his marriage, his wife observed that he was becoming very jealous of her. He would become enraged if he saw her talking to her own brother. After his explosive fits of jealousy, for which there seemed to be no cause, or even the suspicion of one, he would tell his wife that he did not mean what he had said. His jealousy concerning his wife increased, and sometime in 1893, while she was lying in bed with him one night, he tried to choke her. She broke away from him and asked

him what he meant. He smiled and said he was only playing. She at that time noticed no other evidence of mental deterioration, except that he was becoming more irritable. In September, 1893, he first experienced difficulty in writing. Before this he had been a good and rapid penman, having served as bill clerk in the house of representatives during two sessions of the State legislature. The difficulty in writing consisted in misspelling and in transposing the letters of the words. The disturbance soon became so great that it was difficult to make any sense out of what he had written. He had been before his illness fairly good in spelling, but at times was careless. Scarcely a word of any length was spelled correctly a year after he began to experience difficulty in writing. He soon ceased to write as the effort was tiresome to him and he had to spend an hour or more in trying to write a page of note paper. In February, 1894, he suffered an entire night from severe, sharp, shooting pains in the chest in the region of the heart. The attack gradually subsided the next day, but he was left weak and very nervous. He has not had so severe an attack of this since the first one, but every few weeks, since the occurrence of the first, he has experienced sharp and shooting pains in the cardiac region.

In July, 1894, the patient began to suffer from pain in the frontal region. In character this resembled the cardiac pain which he had experienced some six months before. After July, 1894, the head pain became quite frequent, occurring every two or three weeks, sometimes every few days. The pain lasted for a few hours and disappeared after a few hours' sleep. He did not feel nauseated at the time, nor did he vomit. During the paroxysm he frequently found some relief on closing his right eye.

Three months before consulting me, or about the middle of January, 1895, while the patient was conversing

with his wife, he suddenly found himself unable to talk for fifteen minutes. He could not utter a single articulate sound. He says that his mind was perfectly clear at the time, and he thinks that he could have written what he wanted to say, had he not been so nervous. He, however, made no attempt to write. Gradually his power of articulation returned and within fifteen minutes after he was first able to speak, he could call his wife's name, and frame a few sentences connectedly. An hour later all speech disturbance had passed away. Since January the patient on four or five occasions has experienced difficulty in speech which came on suddenly, but at no time has there been a total inability to speak, as in the first attack. Between the seizures of speech difficulty the patient often shows hesitancy in speaking, but, as a rule, he could talk quite well. He says that since January he has had difficulty in remembering proper names, and occasionally has used a wrong word when he knew well the word that he wanted to employ.

Six or seven weeks ago he experienced a peculiar visual disturbance. He says it appeared to him as though he was looking into a tunnel. Outside of his central vision everything seemed hazy and indistinct. His expression was: "It looked to me as though my central vision was surrounded by clouds of steam." The defect in vision lasted for about half an hour, and it has recurred twice since. Yesterday the patient experienced some temporary blurring of vision. It came on suddenly and disappeared rapidly after it had lasted for a few minutes. The difficulty in writing, which was first observed about eighteen months ago, has continued; and this morning he suffered from the frontal pain for one hour.

Examination April 19, 1895.—Physically the patient looks, and says he feels, strong and well. He is unusually well developed and strong. He experiences much less trouble with his stomach than he formerly did. Gait

perfect, no ataxia, no paresis, or paralysis of any muscles. Dyn. R., 236; L., 210. All the deep reflexes about normal except that the knee-jerks seem a little lessened; the reflexes of the right arm are all a little greater than in the left. All the superficial reflexes are present except the cremaster, and their absence can be accounted for by the presence of a double inguinal hernia, which has existed for a number of years. A fine tremor at times is observed in both arms. It is said to come on after exertion and is more marked in the left than in the right arm. All general sensory phenomena are normal. Taste and smell are present and equal. Hearing: Watch, R., 10/12; L., 9/12. Tuning fork is heard a little more distinctly in the left ear. Vision in each eye, 6/9; fields normal, both for light and color; pupils normal in size and react readily to light and accommodation. External ocular muscles act well. Fundi and disks show no pathological change. Slight refractive error. Mental action slow with lessened power of mental concentration, sustained attention, and memory. There is no form of visual or auditory defect in speech. The receptive centers concerned in speech memory seem to act normally. On testing the motor or emissive side of speech, it is found that he can speak voluntarily, but that speech is a little slow, and he occasionally hesitates in pronouncing long words. He repeats words after another quite readily, except that he is slow and deliberate in articulation, and sometimes he hesitates before trying to utter some words. It is observed that the greater the effort he makes in trying to utter a word, the more nearly he succeeds. If the patient makes a mistake he at once recognizes it and usually corrects it. He has no difficulty in thinking in speech. I am unable to discover any special difficulty in the use of any part of speech. He understands and uses gesture expressions in speech. On testing his ability to write a peculiar defect is found. He writes his name perfectly and copies script and printing into script

with scarcely a mistake. In writing voluntarily he transposes the letters of a word, adds and omits letters, so that what he writes makes very little sense unless one knows what he is trying to say. On requesting him to spell words it is found that he spells the words just as he writes them. It seems to matter but little how he spells a word, he usually pronounces it correctly. The thoracic and abdominal organs appear healthy.

The pain of which the patient had complained during the last few months had been referred to the right frontal region, but the more reliable localizing symptom, the disturbance in speech, especially inability to write, the so-called agraphia of the motor variety, pointed to the left frontal region as the seat of some organic brain disease. The opinion was expressed that a tumor was forming in the motor speech center, and affecting more particularly the foot of the second frontal convolution. He was placed upon increasing doses of potassium iodid, requested to remain in town and report once or twice each week. He returned home, a distance of about fifty miles, a day or two later, took the medicine irregularly for a short time, but not improving, he soon discontinued its use entirely. I did not hear from him again until October 24, 1895, about six months after he had first consulted me.

During these months he suffered nearly constantly from dull heavy pain on both sides of the head in the frontal region. He also experienced about twice a week severe paroxysms of acute pain. During these attacks the pain was located in the frontal region, but always worse on the left side, and most intense in the anterior and upper portion of the temporal fossa. The paroxysms usually occurred during the latter part of the day or early evening, and passed away after sleep, as before noted. Their occurrence seemed to be due to exposure to the sun's rays, over exertion, or excitement. Occasionally an attack would be mild, but the next one would be very severe. During

the time the pain was most severe, the scalp over the anterior portion of the head, but more especially over the left side, would become sensitive to pressure. His speech disturbance increased, and he became more irritable and forgetful.

On October 24, 1895, I was hastily summoned to see him at his home, in consultation. In addition to the facts already stated, I learned from his wife that his eyes had not troubled him much since I was consulted, except that occasionally the peripheral fields of vision would become blurred for a few minutes. About May 15, 1895, she observed that her husband did not walk as well as formerly, and six weeks ago he manifested a tendency to go to the left in walking, and would frequently trip because his feet were not raised sufficiently high. He had not been able to dance as well as formerly. There had been for sometime an awkward movement of his hands, and in reaching after things his right hand would close before the objects that he intended to grasp were approached. The patient had become quite nervous, and his power of mental concentration and sustained attention were much lessened. His memory for recent events was very poor, but for those of early life it was unimpaired. He had lost considerable in weight. On two occasions when he was suffering from severe headache, he had projectile vomiting, and seemed to be almost unconscious for several hours each time. Six days before I was summoned, he began to suffer from a paroxysm of severe headache. After it had lasted several hours, he lost his power of speech for two or three days. He seemed in a semi-conscious condition, lay in bed and took little notice of things if not disturbed. He could be aroused and his attention engaged for a short time, but he seemed dazed. He complained of his right arm feeling numb as he began to regain consciousness. When I saw him there was no paresis or paralysis of any muscles; the eyes showed no

change in central vision, fields, fundi, or disks; and all forms of general or special sensations, so far as I was able to determine, were normal.¹ He seemed weak and dazed, and apparently not completely realizing what was going on around him. He made no complaint of anything when left alone, but when I asked him if he had any pain he said "yes," and placed his hand on the left side of the forehead. On percussing the head on both sides, I found an area of tenderness about an inch and a half in diameter, situated on the left side just above the speech center of Broca. He was disinclined to talk, and no attempt was made to test his powers of speech at this time. At my request he was transferred to Denver the same day and placed in St. Luke's Hospital. After putting the patient in the Hospital, he was tenderly nursed, careful and repeated bilateral axillary temperature observations were made, and a record was kept of everything likely to throw any light on the case. The temperature was about equal in each axilla, and usually about .5° below normal. The pulse varied from 72 to 82; respiration from 16 to 24, but it usually remained at about 18.

October 27th: His gait is firm, but there is a little tendency for the body to reel on first closing his eyes while standing, but this passes away in a few seconds. The right hand, while not distinctly ataxic, is used more awkwardly than the left. Dyn. R., 224; L., 200. All leg and arm muscles are strong. A slight tremor is observed in the right hand when he grasps anything very firmly. It is thought that the right thumb and index finger are flexed and extended a little more slowly and awkwardly than the left. He can flex and extend the left index finger without allowing the hand to move at the wrist, but in flexing and extending the right index finger the hand

¹ At first I thought that tactile sensation was lessened over the right hand, but the mental impairment of the patient was too great to enable me to determine this point satisfactorily.

invariably moves at the wrist, although he tries to prevent it. The muscles of the right side of the face appear a little weaker than the left, but the difference is very slight. The tongue deviates slightly to the right in extreme protrusion. There is no wasting of any muscles. Both knee-jerks are a little increased over the normal, the right more than the left, and are decided on reinforcing. Ankle-clonus absent. Tendo-Achillis, R., decided; L., slight. Plantar and cremaster reflexes are absent. Lower abdominal, present; epigastric, R., absent; L., present. The deep reflexes of the arms are increased. There is no trouble with the sphincters of the bladder or bowel. General sensory phenomena are nearly normal. On the lips and tongue on the right side he readily feels the contact of a substance, but two points of the esthesiometer are not differentiated at twice the normal distance. He is unable to localize a substance in gentle contact with the right hand as definitely and quickly as he can with the left. Smell and taste are acute on both sides. Hearing R., $\frac{3}{4}$; L., $\frac{1}{4}$. The tuning fork is heard better in the right ear, even when the left is closed. Central vision, fields, for both light and color, fundi and disks normal. There is an area about one and a half inches in diameter over the left frontal region, in which percussion and firm pressure cause him to wince from pain. The lower border of this area is bounded below by the Sylvian line, posteriorly by the ariculobregmatic line, and anteriorly by a vertical line extending upward from the external angular process of the frontal bone. No change in the percussion note is detected over the sensitive area. There is no tenderness over the corresponding portion on the right side of the head. His mind acts slowly, but he reasons fairly well and his conclusions are usually accurate. He laughs, jokes, and seems contented.

On making a systematic examination into the condition of his speech defect, no auditory or visual speech disturb-

ance is observed. There seems to be no form of sensory aphasia. His answers are slow and he has difficulty in selecting his words, but he almost invariably gets the right one. He frequently omits the last syllable of a word, and sometimes one or more words of a sentence. He has no difficulty in thinking in speech. So far as speech-utterance is concerned, there is a slowness in selecting a word, a hesitancy in uttering it after it has been selected, and some difficulty in pronouncing long and difficult words. He repeats simple words after another quite rapidly and without the least hesitation, but if he has to select these same words in conversation, the task is laborious and is performed slowly. He reads aloud writing and printing quite readily, but not infrequently omits and miscalls words. He says that he has no difficulty in understanding what he reads. Writing is the most difficult task for him to perform. He writes his name slowly and distinctly, but it is not written in the bold, easy hand in which he formerly wrote it. His writing seems so remarkable that I determined to study its defects thoroughly. A business letter written by the patient in March, 1894, was written in a distinct and easy hand, although this was written six months after he first experienced difficulty in writing. There were no errors in spelling, and the letter was connected throughout. On obtaining short letters that he had written to his wife during the six months previous to October, 1895, while he was in Denver or different portions of the State, attending to business, I find that, although nearly every letter was well-formed, the spelling was so bad, so many letters were omitted or added, while others were transposed, that I am unable to read his writing. On asking him to read these letters, he reads portions of them, but supplies words. One curious fact is that, no matter how awkwardly a word is spelled, he usually pronounces it according to what he had meant to write. I notice that to few of the letters that he had

written during the past six months had he attached his name. This seems strange, as he can write his signature without much difficulty. In writing simple words, such as "dog," "cow," "hog," at dictation, he frequently transposes some of the letters, and is as long in writing a single letter as a child is when it is first learning to write. He can write voluntarily, but it requires about two hours for him to write five or six lines. He can read much of what he has written, but miscalls words, inserts some, and leaves out others. When he makes a mistake in writing he sometimes recognizes it and will try to correct it, but he frequently makes a greater mistake in trying to correct one. At other times he is either indifferent to his mistakes or does not perceive them. The effort of writing is very exhausting on him. He can copy fairly well, transcribing both printing and writing into script. On getting him to spell a word aloud, he always spells it just as he writes it, although in either case he pronounces it correctly.

October 28th: On his admission into the Hospital, the 24th inst., blue ointment was ordered rubbed in night and morning, and he was given potassium iodid in increasing doses. He is much brighter and his headache is much less. It has been observed that he magnifies trifles and delights in talking about little things that relate to himself. He talks much better.

October 30th: The surface temperature of the head is registered and is found to be practically the same on each side. It is found that he has more difficulty in remembering the names of persons and places than in remembering the names of objects. It is noted to-day that his nose has bled almost daily during the week he has been in the Hospital. It occurs in the early morning, and it is only by accident that the nurse discovered it. It is learned, however, on inquiry of the patient, that he has frequently bled from the nose during the past month.

November 3d: He is greatly improved, has had no headache for several days, mind is much clearer, but the defect in writing still continues. He decides to leave the hospital and report at my office daily. During his stay in the Hospital he had written me a letter almost daily. It usually consisted of eight or ten lines, but it required him two or three hours to write these. Sometimes he would begin his letter in the morning, write until he got tired, stop, and finish it during the afternoon. Some days the effort necessary to write was so great that he did not feel equal to the task. On his leaving the Hospital he was to write me a letter daily, giving me his history from early childhood up to the present.

November 7th: Diarrhea troublesome. Potassium iodid and mercury are discontinued. On the 10th he has pain in the left frontal region of the head, the first time for nearly two weeks. His letters are much longer and more connectedly written. On the 20th the medicine is resumed. By the 27th he begins to show decided failure. His head pains him, he seems confused and generally discouraged.

November 28th: He says that he was unable to write me his usual letter this morning, on account of headache and dizziness. The tongue deviates decidedly to the right, but there is no apparent paresis of the right side of the face. It is almost impossible to understand him, as he utters words so indistinctly. With an effort he can read aloud so as to be understood, but he substitutes, transposes, and omits so many words that what he reads does not make much sense. He says that he is nearly crazed with pain. Both optic nerves are pale, or almost white, and apparently show beginning atrophy, but vision and fields remain nearly normal. He is given something to relieve his pain and told to keep quiet for the day.

December 1st: He looks pale and distressed. It is impossible at first to quiet him. He wrings his hands

and groans as if in great mental or physical distress. After awhile he tells me that he had not slept any the previous night, and had cried most of the time. He says

FIG. I.

Sept., '85

Dr Eskridge
 three door from my two self,
 three hundred acres of land
 for a acre or Room rick
 & stable house with Barns and
 stables and a Poultryard close
 In Denver I am a good fellow
 man, am the is fore our loge
 and two cleye covers,
 and I want teal game, Ediths
 Please write me your two been
 when I have a few I pray the
 Lord bless my Son Tom George and
 my Papa and my momo ^{and} Edith,
 the Fortune that broachd note
 we did nonta want to live in
 Denver by Cannicide
 & until go to Sixth Hospital

that his distress was not on account of pain, but because he had revealed to me in his letter of the day before the password of the Woodman's Lodge, and he is fearful lest

he will be placed in the penitentiary for it. It is some time before I can convince him that he has written nothing of the sort, and this can be done only by showing him two or three of his previous letters. He then comes to the conclusion that he must have been insane all night. On my advising an immediate operation for the relief of his brain trouble, he readily consents, and seems happy in the prospect of relief.

Fig. 1 is a letter written December 2, 1895, three days before the operation. It seems to admit of the following liberal translation:

"December 2, 1895.

" Dr. Eskridge:

" Dear Sir: I want to sell three hundred acres of land for a house, a six-room brick cottage, with barn, sheds, and poultry-yard, close to Denver. I am a good poultryman. We have four cows, two large and two small dairy cows. I want to tell you Edith's prayer, which she says when she goes to bed, 'When I lay me down to sleep, I pray the Lord my soul to keep and my papa and my mamma, and Edith and whom I love as my own soul.' The furniture that we do not want in Denver I wish to sell. Continued. Until I go to St. Luke's Hospital."

FIRST OPERATION AND SURGICAL ASPECT OF THE CASE.

BY DR. PARKHILL.

Operation, December 5, 1895, 11 A.M. The usual methods had been observed in preparing the scalp for operation on the previous day, including the outlining of measurements in nitrate of silver. At the time of the operation these measurements were transferred to the skull by means of the Parkhill skull-marker. A semi-circular flap with the base downward was raised and a three-fourth inch button of bone was removed from over the region of the foot of the second left frontal convolution. This opening was enlarged with the rongeur un-

til it had a diameter of about one and a half inches. No pulsation was preceptible either to sight or touch and the dura bulged irregularly into the wound. Across the middle of the exposed surface of the dura there was a constricted band-like appearance running from before backward, which held the dura below the surrounding portion of the exposed membrane. On endeavoring to relieve the constriction by cutting through the dura at this point, which was found to be very thick, a straw colored fluid spurted out several inches high, apparently from the substance of the brain. The opening through which the fluid escaped was now enlarged, and about an ounce of fluid in all was found. The cyst which had contained the fluid was situated immediately below the cortex and extended into the brain substance to the depth of half an inch or more. The globular portion of the cyst lay within the white substance of the brain, the constricted neck-like portion in the cortical, and its external boundary was formed by the membranes of the brain. The fluid was watery, straw colored and contained no pus- or tumor-cells. A small rubber drainage-tube was inserted into the cyst cavity and brought out through the middle of the scalp flap. The dura was sutured with catgut, the scalp with silkworm-gut, and the ordinary antiseptic dressing was applied. But little shock resulted from the operation, and the recovery from a surgical standpoint was perfect. On the ninth day the head was dressed and the cavity was apparently almost obliterated. On December 15th, the scalp was raised and gold foil placed between it and the dura, there was practically no reaction from this and his recovery was uneventful.

CONTINUATION OF THE RECORD.

BY DR. ESKRIDGE.

December 5, 11 P.M., about eleven hours after the operation, he is feeling quite comfortable, except a little

nauseated. The right lower side of the face is partially paralyzed and the tongue deviates to the right in extreme protrusion. Motor disturbance in speech very marked, but he is still able to think in words and utter a few voluntarily. He can repeat simple words after another. Two days after the operation, the paresis of the right side of the face had passed away, and he could articulate more distinctly than he could immediately before the operation was performed. December 8th. He is still improving and utters long and difficult words quite well. On the 10th

FIG. 2.

Denver Colo
Dec. 12, 1895—

My Dear Darling,
I am getting along
alright, is Colmambara from Denver.

he attempted to write, and while he formed his letters distinctly, no sense could be made of what he had written because of the bad spelling. On the 11th his attempt at writing was still a failure. On the 12th he spent about an hour in writing to his wife (Fig. 2).

From this time on he showed a gradual improvement in his writing. On December 30th, he copied several lines of writing, and a paragraph from a newspaper, an extract from a political speech, all into script with scarcely a mistake. On the 31st he wrote me a letter of fourteen lines. It was written connectedly, and is easily read, but there are several gross mistakes in spelling, and a few letters are transposed. Every letter is well formed. During January he wrote me a letter about every second day. The letters are written connectedly, and are comparatively easily read.

February 1st, he struck his head against a wooden box,

the sharp corner of the box striking the head at the point where the bone had been removed. The next day he began to suffer from frontal headache, felt dizzy, was nauseated, and vomited. On the 3d and 4th he was quite drowsy, and complained of a numb sensation in the right hand and arm. The hand felt so lifeless that he could not find his pocket with it, unassisted by vision. His vision soon began to fail, he lost flesh, and suffered almost constantly from headache, nausea, and vomiting. It was observed that he was extremely forgetful, and acted foolishly at times. On the 12th he came to Denver and I made a careful examination into his condition. He had lost considerable flesh, looked haggard and depressed. He was suffering greatly from pain in the left frontal region of the head. He was weak, but there was no paralysis of any muscles. The only change in the deep reflexes was an increase of those of the arms. Nearly all the superficial reflexes were absent. All general sensory phenomena normal, except localization and muscular senses. Localization was considerably lessened in the right hand and slightly in the left. Muscular sense was lessened in the arms and hands, but very much greater on the right side than on the left. His mind was much confused, and he did not seem to be able think clearly or connectedly. Hearing, smell, and taste appeared nearly normal. Central vision, with the right eye, was 4/6; left, counts fingers at eight feet. It was impossible satisfactorily to test the fields on account of his mental confusion. There was well-marked atrophy of each optic nerve, much more pronounced in the left eye than in the right. The arteries of the left disk were very small, but those of the right were nearly normal in size. The letter that he wrote me on February 4th, three days after the injury, did not contain a legible word. A few letters were well formed, but most of them were meaningless scrawls. Meningeal hemorrhage was suspected, and an immediate

operation for the relief of pressure on the brain was urged. He was placed in St. Luke's Hospital and operated upon by Dr. Parkhill the following day. On completing the examination on February 12th, I requested him to write me a short letter, and to my surprise he wrote more connectedly, and with fewer errors, than he had been able to do before the first operation (Fig. 3).

FIG. 3.

Denver

two weeks ago I was taking
see Ed Lewis and I'm sick.
I think I had better go
down to see Ed Lewis
and will find out if my
wife has come.

H.C.F.

In this letter he tried to say that he was taken ill two weeks ago on Wednesday, "and I was awful sick. I think I had better go down to see Ed Lewis and will find out if my wife has come."

Most of the letters are well formed, and his own name is written in a bold hand, but only the initial letters of his signature are given for obvious reasons.

SECOND OPERATION.
BY DR. PARKHILL.

On February 13th, it became necessary to operate upon him again. The preparation was the same as for the pre-

ceding operation, excepting only the outlining of the scalp. On dissecting up the former flap the gold foil was found in position, and it had perfectly prevented the formation of adhesions between the scalp and the dura. There was no pulsation. On opening the dura, at the seat of the former cyst, the brain substance had nearly a normal appearance.

The opening in the skull was then enlarged upward and forward. When a half inch of the bone had been taken away, and the dura opened correspondingly, it became apparent that there was a cyst, or membranous-like substance, under the dura. The opening in the skull was further enlarged upward and forward, until it had a diameter approximately of $2\frac{1}{2}$ inches, and the dura incised accordingly. This did not reach the limits of the false cyst. It had a muddy-yellowish appearance and distinctly fluctuated on palpation. The trocar and cannula were passed into it, and there was withdrawn about half an ounce of sero-sanguineous fluid. The cyst was then freely opened with a knife and, upon exploration, it was found to contain quite a quantity of blood clots, perhaps one ounce. It was apparently a closed sac. I then began the dissection of the sac from its seat, by means of the fingers and forceps, and found it extended almost completely over the frontal lobe, reaching down as far as the floor of the anterior fossa of the skull, and dipping into the anterior extension of the middle fossa in the region of the fissure of Sylvius. Internally, it was attached to the falx cerebri. It extended backward over the Rolandic region and the parietal lobe as far as I could reach with the finger and forceps. It was friable, and complete dissection was made only with the greatest possible care. When this was removed, the cortex at its site appeared flattened and depressed to an extent of about half an inch, the brain did not expand after the removal of the cyst-like membrane.

Considerable capillary hemorrhage was encountered during the removal of the false cyst, but this was readily con-

trolled by means of gauze packing and pressure. The cavity was drained, the dura sutured, and gold foil was placed over the dura, leaving only a small opening for the drainage-tube which was brought out through the scalp. The scalp was then replaced and the ordinary dressing applied. Very decided shock followed this operation for the first few hours, but active stimulation overcame this and his progress toward a surgical recovery was uninterrupted. Apparently, however, the brain never regained its normal dimensions, as a decided depression remains at the site of the operation to this day.

CONCLUSION OF THE RECORD WITH REMARKS.

BY DR. ESKRIDGE.

After the second operation he had five or six convulsions, all beginning in the right hand and most of them limited to the right hand, arm, and face, the right leg being involved only on one or two occasions. The left side was not affected. These convulsions began two or three days after the operation, and one and sometimes two occurred on the same day. With the exception of these attacks little of interest from a neurological point was observed until March 6th, nearly four weeks after the operation, when he was able to resume his letter-writing. On that day he spent nearly an hour in trying to write me a letter. The result was: "Elbert, Colo., 6, 1896. My Dear. I Sind." All the letters were well formed. During the afternoon of the same day he wrote me six lines, but with the exception of my name, not a single word is legible, although all the letters are well formed. He had considerable difficulty in articulation at this time, but he seemed to be able to think in speech, and slowly repeat simple words after another. About this time he manifested almost an insane jealousy of every one who spoke to his wife. Although he wrote me a letter almost daily, it was not until the 14th of March that a single legible

word was found in them, if the headings of the letters are excepted. From this time on he showed considerable improvement in his writing and speaking. It became evident as time wore on that he was partially demented.

April 14, 1896: There was a slight uncertainty of gait, especially when the eyes were closed, with a tendency to walk to one side, sometimes to the left, at other times to the right. There was slight ataxia in the arms; none in

FIG. 4.



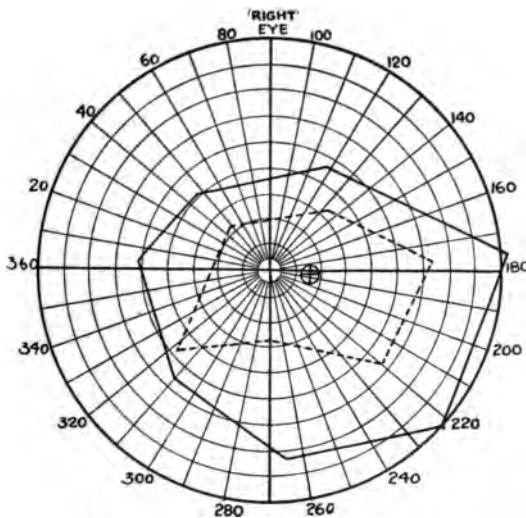
The light circle represents the size of the opening in the skull after the second operation. The dark-shaded area near the anterior border of the circle indicates the extent of the opening made at the first operation. About the center of the dark-shaded area the cyst was found.

trunk muscles. No paresis or paralysis of any muscles. Dyn. R., 190; L., 184; a decided improvement since the last operation. Knee-jerks, R., about normal; L., deci-

dedly lessened; ankle-clonus absent. Plantar reflexes, R., absent; L., slight. Tendo-Achillis, R., present; L., absent. Deep reflexes of arms slightly increased, a little more on the right side than on the left. All general sensory phenomena normal. Muscular and localization sensations, which had been deficient in the right hand and arm before the second operation, were apparently as good as in a healthy person. Hearing, taste, and smell, presented no points of interest. Eyes, R., counts fingers at eight feet; L., counts fingers at two feet. Roughly testing fields, those of the right eye for objects seemed fairly good, but lessened for color, especially for red, etc. The fields of the left eye were all abolished except in the lower quadrant of the temporal side. The pupils reacted to light and accommodation and all the external ocular muscles were normal. Both disks presented whitish atrophy. The capillaries had disappeared, and both arteries and veins were less than the normal size, the arteries being exceedingly small. It should be noted that at no time had the disks presented an edematous appearance. On making a systematic examination into the condition of his speech no sensory defect was found. He could articulate quite distinctly, and seemed to find little difficulty in pronouncing long and hard words after another. He could read nothing except what was written and printed in very large letters, as his vision was so poor. In reading he would still transpose and substitute, and not infrequently omit words. He could converse fairly well, and experienced no difficulty in repeating words and short sentences after another. He could write voluntarily, but transposed, omitted, and added letters, so it was not easy to make much sense out of what he had written. He invariably wrote as he spelled and *vice versa*, but he pronounced the words correctly, no matter what mistakes he had made in writing or spelling. He could copy well, transcribing both printing and writing into script. He evinced no diffi-

culty in thinking in speech. The only defect in speech detected was that observed on testing his writing and spelling. The primary trouble with his speech seemed his inability to spell. He copied quite well and could write correctly if the words were spelled slowly for him. Although considerable time was consumed in making a

FIG. 5.



R. V., 3/50. Continuous line represents field for white and blue, dotted line that for red.

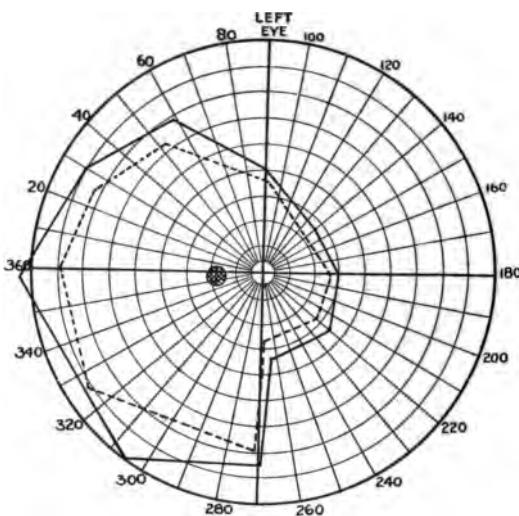
complete and systematic examination of his speech defect, only those results that showed deviation from the normal are given here.

On April 23, 1896, Dr. W. C. Bane kindly made drawings of his fields (Figs. 5 and 6).

The case reported at considerable length in this paper presents many points of interest. The first operation was performed December 5, 1895. For about two years

prior to this date he had shown difficulty in writing, which, on carefully studying, seems to be due to inability to arrange the letters so that they would appear in the regular order in which common usage has assigned them. At the same time he omitted letters and substituted others. It would appear that his speech defect was an inability to

FIG. 6.



L. V., 2/50. Continuous line represents field for white and blue, dotted line that for red.

spell rather than an inability to write, as he could copy both printing and writing with scarcely a mistake, transcribing both into script. He copied much more rapidly than he could write voluntarily, but he wrote at dictation just as slowly as he wrote voluntarily, except when the words were spelled for him. If a word was spelled for him he wrote it readily and correctly. Further, it should be noted, that he formed his letters well, except when he

was suffering severely from headache, or from other causes.

The first operation revealed no pathological condition beyond a cyst in the foot of the second left frontal convolution. He improved rapidly after the immediate effects of this operation had passed away, and his wife wrote me that her husband improved in every way; he seemed brighter, stronger, and happier than he had been for a long time. He tried to do hard work on a ranch which necessitated lifting heavy weights. This proved to be too much for him as his stomach began to trouble him, but no brain symptoms manifested themselves until he injured his head by striking the unprotected brain against the sharp corner of a box. Then all the symptoms of compression of the brain from meningeal hemorrhage became apparent. The mental failure indicated an extensive lesion.

At the second operation which was performed February 13, 1896, the membrane-like substance, by ocular inspection, appeared so well organized, firm and strong that it was thought probable that a more extensive lesion had existed at the time of the first operation than had been detected and removed. Every portion of the material removed at the second operation was preserved and hardened in Müller's fluid for careful microscopical examination. Dr. E. R. Axtell, pathologist to the Hospital, has just completed the examination and reports as follows:

" May 8, 1896.

" The examination of the logwood-stained sections of the membrane, removed from the cranial cavity of W. E. F., reveals nothing but a mass of small, round cells held together by an intercellular substance and by strings of fibrin. In no section do I find any capillaries. The mass presents no capsule, no trabeculae of connective tissue. Nowhere are there any areas of caseation.

" The pathologic diagnosis is inflammatory lymph."

The above report of the pathologist seems to establish the fact that the morbid condition found at the second operation was recent and probably dated from the receipt of the blow to the brain, thirteen days before. Had it not been for this untoward accident the patient might have made a complete recovery.

Graphic Center.—The motor center for writing has been supposed by some to be located in the foot of the second frontal convolution. In this connection Mills¹ says: "Destruction of this region, which is just in advance of the area for the movements of the fingers, hand, and other parts concerned in writing, it is supposed, would cause a true agraphia, although no clinico-pathological case fully corroborative of this state has been put on record."

As has been observed we may learn to write with a pen or pencil held between the teeth, with the fingers, or with the toes. It is very improbable that the same center would serve to guide the movements of the head, hand, or foot in writing. The function of Broca's center, seems to be to arrange the words for speech utterance. May there not be a cortical center, the function of which is to register the memory of the arrangements of letters for the spelling of words? This is a process that is gradually and laboriously learned, and there must be some portion of the brain in which the memory pictures of the arrangement of letters in the spelling of words are registered. When the loss of ability to write intelligently depends upon the loss of the ability to spell, as shown in the case just reported, in which the patient could copy correctly and write well when the words were spelled for him, the agraphia is secondary and the fault in spelling the primary symptom.

[Reprinted from THE MEDICAL NEWS, Aug. 15, 1896.]

OROLINGUAL PARALYSIS AND SLIGHT MOTOR DISTURBANCE IN WRITING, OF THROMBOTIC ORIGIN; OPERATION; RECOVERY.

By J. T. ESKRIDGE, M.D.,
AND
EDMUND J. A. ROGERS, M.D.,
OF DENVER, COL.

HISTORY AND EXAMINATION OF THE CASE.

BY DR. ESKRIDGE.

CASES of orolingual paresis, or paralysis in which disturbance of speech-utterance or articulation is the chief symptom, are so rare as to be worthy of careful study. The following is of special interest, both on account of the limited lesion and the marked improvement following excision of the left degenerated cortical area for the lips and tongue.

M. D. E., male, aged fifty, white, single, born in West Virginia, laborer by occupation, living in Colorado eleven years, was admitted into the nervous wards of the Arapahoe County Hospital, December 12, 1895. Mother and one brother died of stomach trouble, father of diarrhea. No nervous or mental diseases in the family, so far as he knows. The patient had most of the diseases incident to childhood. He always indulged in alcohol, but rarely to excess. He enjoyed good health up to his thirty-fifth year, when he suffered from some kidney trouble. He seemed to recover perfectly from this, and was well until 1890, when he contracted a hard chancre. He had a few secondary symptoms, but none of these were well-marked. He considered himself in good health, although he occasionally suffered from headache, until the first of October, 1895. At that time he began to experience severe frontal and occipital headache. The pain was nearly constant, but exacerbations

of pain were common during the latter part of the day and early evening. This continued, and about the middle of the month his eyesight began to fail, and by the 28th of October he was compelled to quit work, on account of poor vision. He remained in this condition until November 26th, when, while walking on a street in Denver, he began to feel very dizzy, and staggered against a wall to steady himself and prevent his falling. He was in this position for about an hour, and during this time he began to feel pain in his right hand. A few minutes after he felt the pain in the hand, the hand began to open and shut spasmodically, and about the same time he first experienced difficulty in speaking distinctly. He could think what he wanted to say, but could not articulate, except for a few words, so as to be understood. On trying to use the right hand after the spasmody action ceased, he found it was nearly paralyzed. The right leg also was weak, and he walked awkwardly. After a few hours he improved somewhat, especially in the use of his leg and arm, but his articulation was very defective. About a week later he noticed that his limbs were getting weaker and his speech, which had improved, was again becoming very indistinct. His headache continued, but it was less severe than before the attack. Just what his condition was between this time and the day of admission to the hospital, I was unable to learn. The first four days of his stay in the hospital he was so stupid and talked so poorly that it was impossible to make a satisfactory examination, and much of the history of his case was gotten little by little, and more by gesture than by speech.

Examination, December 16, 1895: No ataxia in standing with eyes closed. His gait is halting; he walks forward fairly well, even with eyes closed, but in walking backward the right foot is not carried beyond the left. Slight ataxic movements in the right arm, none in the left. All the muscles of the legs fairly strong and about equal

in strength in each leg, but those of the right are used awkwardly. Dyn.: R., 22; L., 102. All the movements can be made with the fingers of the right hand, but they are performed slowly and awkwardly. Lower right side of the face is nearly immobile, but the right corner of the mouth is a little more retracted than the left, and the lower right side of the face presents a wasted appearance when compared with the left side. He is unable voluntarily to retract or move the right corner of the mouth. He cannot whistle, as the lips on the right side fail to move at will. He can shut both eyes, but he cannot wink with the right eye. He says that he was formerly able to wink with either eye. The tongue is protruded in the median line, but it deviates to the right after being protruded a short time. Knee-jerks are about normal and not much increased by reinforcing. Plantar reflexes are absent. Tendo-Achillis increased. Cremaster reflexes: R., absent; L., present. Abdominal reflexes absent. All the deep reflexes of the arms are increased, and nearly the same on each side. Masseters absent. Tactile sense is everywhere present, but it seems a little more acute over the left hand than over the right. Localization and muscular sensations lessened in right hand. Other general sensory phenomena apparently nearly normal, but it is impossible to make a satisfactory examination, on account of his difficulty in speech-utterance and his apparent inability to comprehend just what is wanted. Hearing: Watch, R., $\frac{1}{6}$; L., $\frac{1}{3}$. The tuning-fork is heard better in the left ear. Smell and taste present no points of interest. Eyes, R. V. equals $\frac{1}{6}$; fields narrowed; pupil normal in size and responds to light and accommodation; disk a little pale, but presents no marked changes. Central vision is the same in the left eye as it is in the right, but the fields seem normal. Other points about the same as noted in the right eye. All the external ocular muscles of both eyes act well.

Mental Condition: He seems stupid, and says that he cannot think, as his mind becomes blank as soon as he tries to think on any subject.

Speech defect: On thoroughly and systematically testing his power of speech, no form of sensory aphasia is detected. He understands printed and written words. He reads inaudibly and comprehends what he reads. On his reading aloud, his articulation is so imperfect that it is impossible to understand what he reads, except a simple word occasionally, which by an explosive effort of the lips, he pronounces distinctly enough to be understood, if one is paying close attention. He can write voluntarily, at dictation, and copy, but he had never learned to write well, and he forms the letters very imperfectly with the left hand. He can write a little with the right hand. He copies printing and writing into script. When asked if he understands what he reads, he nods his head, and with an explosive movement of the lips says "Yes." He repeats simple words after another. It is observed that the greater the effort that he makes to pronounce a word, the more nearly he succeeds in pronouncing it distinctly, thus differing from the defect in speech due to a lesion in Broca's convolution. As well as can be determined, he has no difficulty in thinking in speech. He complains of constant headache.

He was placed upon increasing doses of potassium iodid, and a dram of blue ointment by inunction was ordered night and morning. A careful record of the temperature in each axilla was kept, but little deviation from the normal was observed, and the temperature was usually about the same in each axilla. The pulse and respiration showed nothing abnormal. He was examined two or three times each week, and the record shows that he improved, except in his ability to pronounce words. The headache became less, but did not disappear. He looked less haggard and depressed. The right hand and

arm gained in strength, and the right leg was used much better.

On January 2, 1896, the following notes were made: "The right arm and leg are much stronger and preserve greater freedom of motion than on December 16, 1895. The reflexes remain about the same. Tactile sense slightly lessened in the right hand, especially on the distal portions of the fingers and on lower right side of the face. Localization and muscular sensations decidedly lessened in right hand. He usually fails to locate the contact of a camel-hair pencil on the right side of the lips and tongue. He still complains of headache and a sensation of exhaustion. His appetite is poor. Mentally he is a little brighter. His power of articulation has improved only very slightly. There is some atrophy of the lower right side of the face. The tongue deviates slightly to the right in protrusion. Vertical and transverse corrugation of the forehead seems about equal on each side. He opens and shuts both eyes at the same time well. He can wink only with the left eye. He is unable to whistle or move the right corner of the mouth. In trying to utter words he makes explosive efforts with his lips, and in pronouncing long words he unduly separates the syllables. In uttering the word 'Columbus' he makes three distinct efforts, so the word sounds thus: 'Cul-um-bus.' 'Truly rural': 'too-lil-loo;' second effort, 'too-e-roo-le.' 'Hurry': 'urry,' 'flurry,' 'furry.' 'W': 'dub-you;' second effort, 'dub-ble.' In his letter to-day all the words are spelled and arranged correctly, but the letters are so poorly formed that it is almost impossible to read what he has written, unless one knows what he is trying to write."

The first fifteen days that the patient was in the hospital he steadily, but rather slowly, improved under anti-syphilitic treatment. About the first of January he ceased to improve and began to retrograde. His stomach was disordered, he looked pale and haggard, ate little, and was

nervous and depressed. His speech-utterance was about as bad as it was on the 12th of December, the day of his admission into the hospital. He was placed on quinin, strychnin, and arsenic, and urged to take nourishing food. Finally his headache became so troublesome that I decided to recommend a surgical operation for its relief.

Diagnosis: The symptoms pointed to a growth or a vascular lesion. There were many points in favor of the presence of a tumor. The headache, impaired vision, and distinct localizing symptoms were certainly in favor of a tumor. The absence of choked disks in a small growth in the anterior portion of the cortical surface of the brain is not uncommon. But the rapid onset of distinct symptoms of a localized brain lesion, while it may occur from a tumor, is much more often due to vascular trouble. The wasting of the muscles of the right lower side of the face indicated an irritative lesion in the cortical face center, but a growth rarely occurs in the motor cortical area of the brain without repeated convulsions. The patient's age and his anemic and depressed condition made me suspicious of a malignant growth. It seemed very probable that a growth might have existed for some time, subcortically to the orolingual area, in an ignorant laboring man, without having attracted special attention, and that sudden closing of one of the branches of the left middle cerebral artery might account for the sudden appearance of the paralysis and the disturbance in speech. After carefully studying the case for a number of weeks, I was unable to come to any positive conclusion in regard to the nature of the lesion. The man's condition was becoming worse and his headache was very troublesome, so that surgical aid seemed to offer the only hope of relief. I explained to the patient that he might not gain much from an operation beyond relief from pain, and that his paralysis and speech-defect might still persist. He left the matter entirely with me. I asked Dr. Rogers, the surgeon on duty

at the hospital at the time, to see the case with me. We decided that an operation could do no harm, as all other means had failed to relieve the symptoms, especially the pain. January 17th was set for the operation. He was reexamined on the 16th. Dyn. : R., 52; L., 94. All other conditions were about the same as on the 2d inst., except that the patient was weaker than on that day.

OPERATION AND SURGICAL ASPECT OF THE CASE.

BY DR. ROGERS.

January 17th, 12.30 P.M. : On removing a three-quarter inch button of bone from over the lower ends of the central convolutions, and enlarging the trephine opening to about one and a half inches in diameter, the dura seemed lax, and did not bulge. No pulsation of the brain was felt or seen. Dr. Eskridge applied the Keen double electrode, attached to a large Flemming faradic battery, to the lower portion of the exposed surface of the dura, but elicited no response from any muscles. On his carrying the electrodes a little higher, the thumb and fingers of the right hand flexed. After holding the electrodes in the same position a few seconds, the muscles of the right side of the neck contracted, the head turned to the right, and a slight convulsive movement occurred on the entire right side of the body, except in the muscles of the leg. On incising the dura over the supposed face center, the latter, over an area about three-fourths of an inch in diameter, seemed soft and degenerated. The broken-down area of the cortex, which looked cystic, was excised, without apparently cutting into the white substance of the brain, below. The brain was seen to pulsate as soon as the dura was incised. Gold foil, the size of the opening in the skull, was placed between the scalp and the dura and the wound completely closed. He made a rapid and uneventful recovery from the surgical operation.

MICROSCOPICAL EXAMINATION OF THE EXCISED
PORTION OF THE CORTEX.

BY DR. AXTELL.

The brain-cells are apparently lessened in number. They seem to be smaller than normal and to present open spaces about them, which are filled with fluid and granular material. The blood-vessels show slight thickening of intima and adventitia. The neuroglia is somewhat increased in amount, and shows an increase in its cellular elements. The pathologic diagnosis is local cerebritis.

CONTINUATION OF THE RECORD, WITH REMARKS

BY DR. ESKRIDGE.

The degenerated portion of the cortex was circumscribed, about half an inch in diameter, and apparently limited to the left face area. The affected portion was much softer than the surrounding cortex, and, on cutting into it, it had a cystic appearance and contained a few drops of straw-colored watery fluid. The pia was firmly adherent to the cortex over the degenerated area. No muscular contraction occurred when the electrodes were applied to the dura over the affected portion of the cortex, nor when the electrodes were brought into direct contact with this portion of the brain after the dura had been incised, but that the face area was involved by the lesion seemed to be proved by the thumb and fingers of the right hand contracting on the electrodes being carried just above the area invaded by the pathologic process.

After the operation the lower right side of the face was almost completely paralyzed, but the tongue did not deviate much to the right on protrusion. The right hand was almost completely paralyzed for a few days. His power of speech-utterance was worse than before the operation, so that scarcely a word that he attempted to speak could be understood. Deglutition did not seem to be much

affected. Tactile and localization sensations were lessened on the skin covering the affected muscles, but pain and temperature sensations remained nearly normal. He experienced no difficulty in understanding or thinking in speech. The clinical record after the operation shows nothing of any special importance. The temperature remained about the same in each axilla, and was practically normal after the first few days.

January 20th, the following notes were made: "Dyn. : R., 32; L. 86. Lower right side of the face, including nose, is completely paralyzed. The right eye can be opened and shut with the left, but the upper lid of this eye cannot be moved without moving the corresponding lid of the left eye. The tongue is protruded nearly in the median line. Pronunciation worse than before the operation. Localization is perverted in right hand, but normal over the face, except on right side of upper and lower lips. Temperature and pain sensations apparently normal everywhere. Tactile sensation seems very good, except in right hand and over right side of lips, where it is slightly lessened in acuteness." It will be observed that the right hand, three days after the operation, was about two-thirds as strong as it was immediately before, thus showing the hand-center had not been excised. From the 20th of January until about the 1st of March he scarcely showed any improvement. He did not seem to suffer much from the immediate effects of the operation, but he was so anemic and weak that he did not rally, gain strength, or put on flesh. He suffered a great deal from headache, was despondent and nervous, ate but little, had great difficulty in digesting his food. He continued weak and anemic for five or six weeks after the operation.

Early in March improvement became manifest. He began to utter his words more distinctly, his headache lessened and finally disappeared, he put on flesh, and soon looked much better in every way. He was now required

to write a letter daily and to read aloud for an hour or so each day. He has made slight improvement in writing, but it is yet almost impossible to read what he has written. He, himself, has great difficulty in reading his own writing, except immediately after he has written. As he began to form many letters so that they could be made out, it was found that he misspelled and occasionally transposed phrases. It must be remembered, however, that he never learned to write well, and probably always spelled poorly.

Examination, May 15, 1896: The patient looks the picture of health, and seems bright and cheerful. His gait is good and he can walk briskly without scarcely showing any limp in the right leg. With eyes closed he walks backward and uses the right leg as well as the left. There is no ataxia, except in the right arm and hand. He uses the right hand and arm slowly and awkwardly. All the leg muscles are strong. Dyn.: R., 100; L., 115. Knee-jerks both increased, right a little more than the left; ankle clonus and plantar reflexes absent; tendon-Achillis and cremaster reflexes present; abdominal reflexes absent; all the reflexes of the arms increased, the right more than the left; masseters absent; all general sensory phenomena normal. Hearing, taste, and smell present no points of especial interest.

Eyes: R. vision, $\frac{4}{6}$; L., $\frac{4}{6}$. Fields are normal. The pupils are normal, equal in size, and react readily to light and accommodation. All the external ocular muscles act normally. The fundi and disks present no pathologic changes, except that the disks look a little pale.

The right lower side of the face is wasted in comparison with the left. He says that his face was symmetrical before the beginning of his present trouble. The parts around the mouth, on casual inspection, seem drawn to the right, but this appearance is due to the wasting, as the center of the lips still remains in the median line. He is able to move the right corner of the mouth much more

freely than he could before the operation. Both eyes close well at the same time, but he cannot close the right eye without closing the left. The tongue deviates slightly to the right in extreme protrusion. He is unable to whistle; formerly he could whistle quite well.

Speech: The speech-defect is of the same character in every particular as was noted at the former examination, but he articulates much better. With a decided effort he can slowly and deliberately pronounce most words. Sometimes it requires two or three attempts to pronounce a long word, but in the end he usually succeeds. The lips and tongue are not paralyzed, but ataxic. They present very much the same condition that is found in the muscles of the right hand and arm. He has no difficulty in thinking in speech. He still writes much worse than he did before the paralysis of the right hand occurred. The writing with the left hand is fairly good for one who never wrote even an ordinary hand. He does not transpose any letters. Simple words he spells and writes correctly. If a word is spelled for him, he does not write it any more rapidly or correctly than when he is allowed to spell it himself. The defect in writing seems almost entirely due to the ataxic condition of the muscles of the right hand and arm. His headache has entirely disappeared, and his mind is clearer, although specific medication was never resumed after the operation.

The results of the operation in this case fully justify its repetition in similar cases. There is no doubt that localized cerebritis acts as an irritant, giving rise to headache and interfering with cerebral function. Kussmaul and others give muscular wasting of the face, in connection with defect in speech, as one of the diagnostic symptoms of bulbar lesion, in contradistinction to one occurring above the nuclei of origin of the cranial nerves concerned in articulation and phonation. But few writers, so far, have laid much stress upon the fact that an irritative cor-

tical lesion may cause rapid and pronounced wasting in the group of muscles involved. The second case reported in this series is a striking example of this. One of the chief symptoms between atrophy of the muscles from a nuclear lesion and from one in the cortex is that in the latter the affected muscles respond normally to electricity, while in the former they do not. The wasting from irritative cortical lesions is probably due to an inhibitory influence on the trophic centers, while that which occurs from a nuclear lesion is due to the direct effect on the trophic centers of the muscles themselves.

The defect of speech from orolingual paralysis will be considered more fully in a paper devoted to aphasia.

July 3, 1896, William E. was so well that he decided to leave the hospital and earn his own living. At this time, he talked so as to be readily understood, could communicate his thoughts in writing, walked with only a slight limp in the right leg, and used his right hand fairly well.

Nothing further was heard of him until the morning of July 8th, when he was found in his room in an unconscious condition and was supposed to be suffering from a poisonous dose of morphin, as his pupils were pinhole in size and the respiration was slow and irregular.

He was immediately taken to the county hospital, and I saw him shortly after his admission; 11.30 A.M., he was completely comatose; the pupils very small, equal in size, and did not respond to a strong light; the left eye diverged and turned slightly upward. Corneal reflex; R., absent; L., present. Knee-jerks, both enormously increased and attended with slight clonus. Ankle-clonus present, but slight, and a little more pronounced on the left side than on the right. The resident physician stated that when the patient was first brought into the hospital, the ankle clonus and the other deep reflexes were more marked than when I examined him. Plantar

reflexes absent. Tendo-Achilles: R., slightly increased; L., decided and attended by slight clonus; cremaster and abdominal reflexes absent. All the deep reflexes of the arms, including the deltoid and pectoralis major, were greatly exaggerated, but more marked on the left than on the right side. The masseter reflexes were not tested. Pulse was 108, small and very compressible; respiration 14 per minute, intermittent, short, and spasmodic, or jerky, in character. One hour and a half before I saw him, his axillary temperature had been: R., 100.8°; L., 99.8°. At the time of my first visit, it was R., 102.2°; L., 102.2°. Unconsciousness was so profound as to make it impossible to test any form of sensation. The bladder was emptied by means of the catheter, and the urine found to be free from albumin or sugar. The lungs and heart presented no evidence of disease.

From the loss of the right corneal reflex, on account of the enormous increase of the deep reflexes, greater on one side (the left), the jerky character of the respiration, and the elevated temperature, without any renal or intrathoracic complications to account for it, especially as the temperature had increased about two degrees in 90 minutes, opium poisoning was excluded. Instead, a diagnosis of thrombotic occlusion of a vessel affecting the arterial blood supply to the right side of the pons was made.

At 6 P.M. the axillary temperature was: R., 104.2°; L., 104.2°. He gradually sank and died the next day about noon. The temperature did not go above 104.2°. It fell one degree in each axilla from 6 P.M. of the 8th to 6 A.M. of the 9th, but rose to 104.2° just before his death, a few hours later.

Autopsy four hours after death.

On reflecting the scalp, the gold foil was found *in situ*, but it was perforated in several places, and adhesions between the dura and scalp had formed through the openings in the gold foil. There were no abnormal ad-

hesions found between the dura and bone. At the seat of the operation, the membranes were found firmly adherent to each other and to the brain substance. No other adhesions, except the one just noted, were found between the dura and soft membranes. In the left middle cerebral artery, just peripheral to the point at which the anterior cerebral is given off, there was a patch of arteritis on its under and posterior surface about one-quarter of an inch in length and extending about half-way around the vessel. The coats of the vessel were thickened and roughened, but the lumen of the artery was not occluded. The anterior cerebral and right middle cerebral arteries appeared normal. The right posterior cerebral artery presented several patches of arteritis that completely encircled it. The right posterior choroid artery, which is a branch from the posterior cerebral, was completely occluded. The left posterior cerebral, the basilar, and vertebral arteries, presented no further evidence of disease beyond little whitish spots that were evidently the seat of beginning arteritis. The pia was readily stripped from the brain, except at the point of the operation, where it could not be detached without taking a portion of the cortex with it.

It was found that the dura had been incised, and the cortex scraped at a point situated at the lower end of the fissure of Roland, and that the adjacent portions of the cortex of the ascending frontal and ascending parietal convolutions had been invaded by the surgeon's spoon. The cortical substance immediately around the site of the operation of the convolutions was slightly softened and a little yellowish in appearance. On the under surface of the posterior portion of the operculum there was an area of yellowish softening about one-quarter of an inch in diameter and not more than one line in depth. The insula and the third frontal convolution were normal in appearance. In the left lenticular nucleus, at a point

corresponding to the angle of the internal capsule, there was found an old cyst about one-quarter of an inch in diameter, and just behind this, with an intervening bridge of white, fibrous-looking tissue, another cyst of about the same size was discovered. The cysts contained a yellowish, flocculent, watery liquid, evidently the result of softening from arterial occlusion. The remainder of the left side of the cerebrum, the entire right cerebrum, and the whole of the cerebellum, presented no abnormal appearance. The crura seemed normal. On sectioning the pons and medulla, the entire right side of the pons and the upper portion of the medulla of the same side, showed evidence of marked vascular change. The tissue was less firm than on the opposite side, appeared edematous, with spots of hemorrhagic extravasation, which was in marked contrast to the corresponding structures on the left side.



[Reprinted from THE MEDICAL NEWS, Sept. 5, 1896.]

**MOTOR AND SENSORY APHASIA OF SEVEN
YEARS' DURATION, DUE TO PROBABLE
THROMBOSIS FOLLOWED BY ANGI-
OMA; OPERATION; RELIEF OF
PAIN; SLIGHT IMPROVE-
MENT IN SPEECH.**

By J. T. ESKRIDGE, M.D.,

AND
CLAYTON PARKHILL, M.D.,
OF DENVER, COL.

THE following case seems to indicate that the usefulness of cerebral surgery may be further extended.

James S., aged forty-five, single, born in Ireland, a miner by occupation, has been living in Colorado nearly twenty years.¹ Seventeen years ago, while blasting in a mine, he was injured by a flying piece of rock. The right hand and left knee were severely cut and bruised, and the skull was crushed in just above the left eye. He recovered from the immediate effects of the accident, but has suffered from headache in the left frontal region from that time up to the present. Ten years after the injury, he suddenly lost his speech. It is impossible to learn from his history whether he has indulged in alcohol to excess or has ever contracted syphilis. Of the circumstances attending the onset of his loss of speech, I can find out nothing. Three years later, or four years ago, he was adjudged insane and sent to the Colorado State Insane Asylum. During his stay there his speech has been confined to "yes" and "no," which he does not always use correctly, and a few profane words.

On January 27, 1896, during an official visit at the

¹I am unable, on account of the patient's aphasic condition, to learn anything of his family history, and only a few items can be ascertained concerning his personal history.

State Asylum for the Insane, through the courtesy of Dr. Thombs, the superintendent, I was permitted to make a thorough examination of the patient.

The gait is good and no ataxic symptoms are observed. All the leg muscles are strong. Dyn. R., 200; L., 232. The right wrist had the tendons severed in front during the mine accident, and this hand is now much cooler than the left one. There is no paralysis of the facial muscles, and the tongue is protruded in the median line. Knee-jerks, R., about normal; L., a little lessened. Ankle-clonus absent. Tendo-achillis, R., slight; L., absent. Deep reflexes of the arms are all increased, the right more than the left. Masseters absent. Sensation: All general sensory phenomena are normal on the left side. Right side, tactile sense lessened throughout this entire side of the body, but least in trunk, thigh, and upper arm, most decided over foot, hand, and face. Localization and muscular sensation lessened. Temperature, pain, posture, and joint sensations, so far as I am able to determine, are nearly normal. Hearing: Watch, R., not at all; L., on contact. Tuning-fork heard with both ears, but it is impossible to determine in which one it is heard most distinctly. Smell present and equal on each side. Taste, he can recognize salt only on the left side of the tongue. Eyes: Central vision, fields, disks, fundi, internal, and external muscles are normal. His memory is good. He often feels dizzy, and at times has a tendency to fall backward. He has a constant numb sensation on the right side of the body, but he experiences no pain. He frequently feels confused, especially when he is trying to concentrate his mind on any subject. He has no delusions and shows no evidence of insanity. He is a strong and vigorous man, enjoys the liberties of the place, and is almost constantly employed in doing chores around the Asylum. He complains a great deal of headache in the left frontal region of the head.

Aphasia.—He recognizes objects and their uses when presented to him through any of the senses on the left side, and through all the senses on the right side, except that of hearing. Considerable time is consumed in testing his power to recognize objects with the right ear. He recognizes a watch, bell, or coins when heard by the left ear. He can hear a loud ticking watch with the right ear, but the sound of a watch, of a bell, or of jingling coins, when heard by this ear alone, apparently conveys to his mind no distinct meaning other than that of noise. He readily recalls the spoken names of objects presented to him through all the senses, except that of hearing on the right side. Sometimes he seems to recall the spoken name of an object heard by the right ear, and at other times he does not. His answers have to be taken with caution, as he says "yes" sometimes when he means "no," and when he becomes fatigued he is nervous and excitable. He seems to understand speech and music on first testing for this power, but it is found that he appreciates fully only the commoner things that are spoken to him. Some things have to be repeated several times before he seems to understand them. If one talks to him in an ordinary conversational style he becomes confused. He has no difficulty in recognizing his own name when it is spoken, or a word when it is spelled aloud. It is impossible to get him to understand what is wanted when I endeavor to test his power to call up mentally the sound of a note, figure, letter, or word. In testing his power to recognize notes, figures, letters, words, or colors seen, it is found that he can do so only for a few. He soon gets confused. He can read nothing aloud, and it is doubtful whether he can read inaudibly so as to understand what he reads, except a few familiar words, *e.g.*, Asylum, Dr. Thombs, Pueblo, etc. He recalls a few familiar objects, the names of which are seen. He does not seem to be able to write voluntarily, nor at dictation.

He copies fairly well, both printing and writing, but does so mechanically. He cannot write the name of any object presented to him through any of the senses. He does not understand what he has copied, except when he has copied some familiar words. He cannot be induced to try to write his own name, but he reads and understands it when written by another. He does not recognize a letter when his index-finger is made to trace it. It is impossible to determine whether he can call up mentally the appearance of an object, figure, note, letter, or word. He cannot speak voluntarily. His entire vocabulary is limited to "yes," "no," "G—d—d." These words are used automatically, or simply reflexly. He can, however, usually manage to say "yes" or "no" voluntarily when requested to do so. At times he can voluntarily utter his profane expression, but at other times he cannot. The patient cannot propositionize. He understands and uses gesture expression. He can read figures inaudibly, and apparently understands the value of most figures taken separately. He shows no evidence of understanding most numbers above ten. He can add two numbers, but cannot subtract, etc. He seems to recognize money, but it is doubtful whether he appreciates the value of each denomination. He can play cards and other games.

Diagnosis.—The first question to decide was the connection of the injury to the head, which occurred seventeen years ago, with the aphasia, which followed ten years subsequently. Immediately above the left superciliary ridge, there is an old cicatrix, and beneath this, the bone is depressed to a depth of about one-quarter of an inch. The headache of which he complains dates from the time of the injury to the head. As the aphasia did not occur until ten years after the receipt of the blow to the head, it is believed that there is no direct connection between the former and the latter. It is thought, however, that the head injury may have caused a local pachymeningitis,

and that this may have extended backward and produced some changes in the cortical branches of the middle cerebral artery. It is thought that the immediate cause of the aphasia was a thrombotic occlusion of cortical branches of the left middle cerebral artery. The aphasia is distinctly motor and sensory in character. The motor aphasia is nearly absolute, the sensory partial. There is no distinct word deafness or mind blindness, but a partial apraxia and mental enfeeblement, as shown by his mistakes in the use of some objects, and his inability to concentrate his mind without becoming confused and exhausted. The existence of the complete motor aphasia prevents a satisfactory test being made of the sensory.

The next question to decide was whether any surgical operation would likely be followed by benefit to the patient. Dr. Clayton Parkhill of Denver, one of the consulting surgeons to the Asylum, was visiting Pueblo at the time of the examination. He was requested to see the patient with me. He was of the opinion that the depressed fragment of bone should be elevated, as this might relieve his headache, but in regard to further surgical procedure, he declined to express an opinion, preferring to be guided by the results of my examination.

After studying the case carefully, I became firmly convinced that there was no direct connection between the old head injury and the aphasia. The cortical area involved by the lesion in the left hemisphere seems to be extensive, and is supplied by the first part of the second, and the fourth cortical branches of the left middle cerebral artery. The main lesion was at the point of the bifurcation of the Sylvian fissure. In view of the marked improvement following excision of the degenerated orolingual center, in a patient operated upon for me by Dr. Edmund J. A. Rogers, at the Arapahoe County Hospital, some two and a half months before the time set for

this operation, I decided to recommend excision of the cortical surface of Broca's center in this case.¹

REMARKS UPON THE OPERATION AND SURGICAL
ASPECT OF THE CASE.

BY DR. PARKHILL.

Operation, March 1, 1896, 10 A.M.: On elevating the depressed fragment of bone above the left orbit, it was found that the left frontal sinus only had been involved in the injury. The anterior wall had been crushed in, while the posterior was intact. The depressed bone was removed and the sinus scraped out and packed. The measurement on the scalp were then transferred to the bone. A semi-circular flap was raised, with its base downward, and a half inch button of bone removed from over Broca's convolution. The opening was enlarged until it had a diameter of about two and a half inches. The dura was found to be normal. On opening it, however, and reflecting it, an arterio-venous aneurism of the pia was at once preceptible. As might be expected in such a condition, the veins predominated, giving to the surface of the brain a bluish tinge. Pulsation was very faint. The greatest change in the vessels was found over the speech center of Broca, and extended upward and backward in the direction of the horizontal branch of the fissure of Sylvius. The dilated vessels were secured above and below by means of numerous catgut ligatures, and the intervening portion was excised. It was believed inadvisable to enlarge the opening in the bone further in an attempt to remove all of these dilated vessels, as it would make the operation so extensive as to be hazardous to the patient's life. The cortical substance in the region from which the angioma had been removed seemed soft and degenerated, and a considerable portion of this was excised. During the operation there was considerable

¹ MEDICAL NEWS, August 15, 1896, p. 176.

capillary hemorrhage, which was fairly satisfactory controlled by gauze pressure. Inasmuch as there was not absolute hemastasis, a small rubber drainage-tube was introduced, the dura sutured around it by catgut, and it was brought out through an opening in the scalp flap. The scalp was sutured with silkworm-gut, and the ordinary dressing for these cases was applied. The patient rallied well from the operation, and showed very little evidence of shock.

On April 24th, Dr. R. W. Corwin of Pueblo, elevated the scalp flap and inserted a disk of gold foil between it and the dura. From this, the patient made an uneventful recovery.

MICROSCOPICAL REPORT.

BY DR. E. R. AXTELL.

In the specimen submitted for examination was found a mass which was very soft and pulpy, and which, when examined, was found to be composed of dilated blood-vessels having walls which resembled small veins and arteries. A few of the vessels looked like new formed vessels, but most of them seemed to be preexisting blood-vessels, dilated. Along with this dilatation, there is an increase in the amount of connective tissue. The vessels present a general tubular outline, but show fusiform and sacculated dilatations. Pathologic diagnosis is simple angioma.

FURTHER NOTES ON THE CASE, WITH REMARKS.

BY DR. ESKRIDGE.

The patient was able to be up on the eighth or tenth day after the operation, and at the end of the third week it was observed that he had added to his vocabulary four words: "cold," "snow," and "good morning." He had never been known, since he had been in the asylum, to use the expression "good morning," until about three

weeks after the operation, when on meeting the superintendent one morning, and being accosted "Good morning, Jim," he replied "good morning." The words "snow" and "cold" had not been uttered by him before. These words apparently were not uttered entirely voluntarily, as he could not repeat them on being requested to do so. He did not recover his general health very rapidly after the operation, and in consequence the gold foil was not inserted between the scalp and dura until the latter part of April. His headache has been relieved by the operation, and the superintendent of the asylum, Dr. Thombs, says that the patient seems brighter than he has at any time during the previous four years.

On my visiting the asylum, April 29th, a few days after Dr. Corwin had inserted the gold foil, I found the patient in bed, but cheerful and free from pain. At that time, his speech did not seem much better than it did before the operation, but as the wound had been so recently reopened for inserting the gold foil, it could not be expected that if he had made any improvement in speech it would be manifest then, and besides I made no thorough examination to test his speech.

May we hope to benefit old aphasics whose lesions have been limited to the cortex by surgical measures? If so, what is the explanation of favorable results following surgical procedures? It is probable that a degenerated cortex, from occlusion of a vessel, may act as an irritant, and give rise to headache, and exert an inhibitory influence on adjacent cerebral structures, especially on corresponding portions of the cortex in the opposite cerebral hemisphere. The greater the inflammatory condition in the cerebral substance following occlusion of a vessel, the greater the probability of headache and inhibitory influence of the lesion. Removal of the source of the irritation under such circumstances might relieve the headache. Just how much improvement of function may follow

removal of the old degenerated portion of the cortex, time, with ample experience, must decide. If nothing more is accomplished by excising softened areas of the brain than the relief of persistent headache, the operation is entirely justifiable.

In regard to the angioma, I am inclined to think that while an abnormal condition of the blood-vessels, involving most of the cortical branches of the left middle cerebral artery, may have existed since birth, the pronounced dilatation of the vessels occurred subsequent to the development of the aphasia, which probably came on suddenly. His speech had been excellent before this. It would be interesting to know the state of the corresponding vessels on the opposite side of the brain.

Further report of this case will be made in about a year.



[Reprinted from THE MEDICAL NEWS, Sept. 19, 1896.]

**SPEECH DEFECT AS LOCALIZING SYM-
TOMS, FROM A STUDY OF SIX
CASES OF APHASIA.**

BY J. T. ESKRIDGE, M.D.,
OF DENVER, COL.;
NEUROLOGIST TO THE ARAPAHOE COUNTY AND ST. LUKE'S
HOSPITALS.

THE various defects in speech caused by lesions of the brain constitute an intensely interesting subject for study, both from the standpoint of the psycho-physiologist and from that of the practical physician, especially the neurologist.

In this paper I shall endeavor to deal with the importance of some speech-defects as localizing symptoms.

In all of the six cases of aphasia that have been reported by me in this journal¹ in connection with the surgeons, Drs. Rogers and Parkhill, who operated upon the patients, the defects in speech were the principal symptoms, and in three of them they were practically the only localizing symptoms. In these three cases, guided alone by the character of the disturbance of speech, I was able to recommend surgical procedures which proved successful in averting fatal terminations.² In one³ of the other cases of the series the symptoms of speech-defect were the only ones present for a time, and were sufficiently marked from the first to establish a diagnosis of organic disease of

¹ MEDICAL NEWS, June 6 and 20, July 11, August 1 and 15, September 5, 1896.

² Case 1, 2, and 4, *Ibid.*, June 6 and 20, August 1, 1896.

³ *Ibid.*, July 11, 1896.

the brain. At the time of the operation on this case for the removal of the growth from the brain, these symptoms were relied upon to determine the extent and the exact location of the tumor. In the remaining two cases¹ of the series the speech-defects constituted the troubles for which the operations were performed.

The last three cases in the series published presented defects on the motor or emissive side of the speech mechanism. The first² of these three is the most interesting on account of the distinctness of the symptoms, the care with which they were observed, and the limited character of the lesion found at the time of the first operation. A detailed description of all the symptoms will be found by referring to the number of this journal in which the case has been published. Briefly stated they were, a loss of the power to spell or to arrange the letters in a word; loss of the power to write intelligibly, because the letters were jumbled together in an irregular manner, but the letters of the alphabet were formed perfectly. In studying his spelling from day to day, it was observed that while there was a certain similarity in the manner in which he arranged the letters in the words he spelled the same word differently from time to time, thus showing an uncertainty in his own mind in regard to how a word should be spelled.

Bastian³ gives the copy of a letter written him

¹ MEDICAL NEWS, August 15, September 5, 1896.

² *Ibid.*, August 1, 1896.

³ Bastian, "Paralysis from Brain Disease," pp. 189 and 190.

by one of Sir Wm. Jenner's patients while he (Bastian) was a resident physician in University College Hospital in 1869. The recorder states that the handwriting was very good, and that the letter, which is a long one, contained only two trifling erasures. While there are several mistakes in spelling, the principal errors consist in the transposition and omission of words. Unfortunately this case is not given in sufficient detail to enable one to determine whether the defect in writing was due to a lesion in the receptive (sensory) or emissive (motor) side of the speech mechanism.

Kussmaul¹ quotes several cases from a paper written by Bastian. One of these was observed by Hughlings Jackson. In it, the misspelling was the most glaring speech-defect. The patient in attempting to write her name, wrote "Sunnil, Siclaa, Satrena," and for her address, she wrote the following: "Sunestr nut to mer tinn-lain." In another case observed by Bastian, the patient tried to write "Royal naval medical office belonging to the Admiralty," wrote "Roydnendd navendendd oforendendd Belondlendd." The patient observed by Ferber, an account of whose case is quoted by Kussmaul in this connection, wrote "schrüssen" for "grüssen," "schreigen" for "schreiben," "butter" for "mutter," "omdern" for "modern," and in her own name put a "g" in place of "ch."

In none of the above-quoted cases was the pathologic lesion determined by an autopsy or

¹ "Cyclopedia of the Practice of Medicine;" Ziemssen, vol. xiv, pp. 789 and 790.

surgical operation, and Kussmaul fails to quote the clinical records of the cases to a sufficient extent to enable one to determine the probable seat of the lesion. The spelling, however, in most of the cases is similar to that found in the fourth case of this series. This case, so far as I know, is the first one placed on record in which a lesion limited to the foot of the second frontal convolution has been found, either at the autopsy or by a surgical operation for the relief of the brain symptoms, in which the speech-defects have been observed and studied. The symptoms were carefully observed, and the primary defect in speech seemed to be an inability to arrange the letters in words in the order in which he had learned to place them. The man was intelligent, fairly well educated, and for years had held a responsible position that required him to be accurate in his spelling and writing. The defect in spelling led to his writing in an unintelligible manner. Besides the defect in spelling, there was an inability to arrange the words in a sentence according to grammatical usage, syntactic disturbances in speech or akataphasia.¹ Syntactic defects in speech are found most typically in some cases of sensory aphasia. In the second case published in this series, the power to spell was perfect, but akataphasia was pronounced.² (One reason for concluding that the primary defect in speech, in the third case reported,³ was an inability to spell

¹ Steinthal, "Cyclopedia of the Practice of Medicine," Ziemssen, vol. xiv, pp. 791 to 798.

² THE MEDICAL NEWS, June 20, 1896.

³ *Ibid.*, August 1, 1896.

rather than an inability to write, was the patient's power to write readily and correctly on my spelling out the words for him.) I have a case under observation at present, in connection with Drs. Hopkins and Mager, in which the inability to spell is even more marked than in the case reported in this series. Other symptoms in the case just referred to, point to a lesion in the left frontal lobe, and an operation for the relief of the patient is contemplated as soon as the consent of the relatives is obtained.¹

Loss of the power to spell correctly undoubtedly occurs in persons who are suffering from sensory aphasia, but these cases are easily distinguished from the cases of aphasia in which no visual or auditory disturbance of speech is found. It is probable that most cases of the loss of the power to spell due to a lesion in the foot of the second convolution will be associated with some impairment of the mind, the degree depending upon the character and extent of the lesion. Further observations are needed before we can determine whether those cases termed dyslogical paraphasias² can be distinguished from those forms of aphasia in which the defect in spelling is apparently the primary and principal symptom.³

¹ Kussmaul.

² The patient was operated upon by Dr. Mager, the left second frontal convolution was found diseased, but the lesion was so diffuse that symptoms of aphasia lost much of their apparent localizing value.

³ In these cases, if the loss of the power to write is due to the loss of the power to spell, is the word agraphia the proper term? It has occurred to me that the word anorthographia might be employed instead. Professor Maurice G. Dunham, professor of Greek in the University of Colorado, for some very good reasons

If any conclusion is justified in the observation of one case, it would be that a lesion in the foot of the second frontal convolution on the left side in right-handed persons and probably on the right side in left-handed individuals will give rise to a defect in speech in which the principal symptom will be the loss of the power to spell.¹ It should be borne in mind that a lesion, such as a tumor, abscess, cyst, and probably thrombotic softening occurring in the foot of the second frontal convolution will interfere to some extent with articulation, the mentality of the patient, and in many cases with the function of Broca's convolution. It is probable that the syntactic disturbances in speech depend upon the impaired mental condition of the patient. "Unlike words, sentences are not stored up in memory ready for use."²

Does a center for writing exist? According to Bastian and others, cases of agraphia have been observed in which the patient was unable to make more than meaningless strokes. These patients have been unable to read or spell correctly. We can write with a pen held with the teeth, hand, or foot. It is very improbable that the same center in the cerebral cortex would serve to guide these various widely separated groups of muscles in writing. On the other hand, no matter what groups of muscles we employ in the formation of

seems to prefer the term scoliographia instead of anorthographia. The principal objection which he makes to the latter term is the use of the "an" to denote negative. "An" is in common use before arthria to denote the negative.

¹ It is possible that the primary defect is in the inability to pronounce.

² Kussmaul.

letters, the arrangement of the letters in a given word is always the same. It seems to me more probable that the memory for the arrangement of letters in words is stored up in the cerebral cortex. This process is learned by tedious and repeated repetition. We should naturally expect to find the cortical center in which is registered the memory pictures for the arrangement of letters in a word, to be located near the center which governs the muscles usually employed in writing. It will be interesting to observe whether a lesion in the second frontal convolution on the right side of the brain in right-handed persons is attended with any loss of the power in spelling. So far as I can see at present, it is impossible to investigate the orthographic center in a very illiterate person.

Dr. Charles K. Mills has recorded a case of defective speech utterance from orolingual paralysis.¹ In his case, the lesion involved the lower portions of both central convolutions on the left side, the foot of the left frontal escaping almost entirely. Articulation was imperfect, but the patient could talk. In the fifth case² reported in this series, there was very decided weakness, in fact, almost complete paralysis, of the orolingual muscles of the right side, and an inability to utter words, except the simplest ones, with sufficient distinctness to be understood. It was impossible for a listener to understand what he

¹ A "Text-book on Nervous Diseases," by American authors, pp. 409 and 410.

² THE MEDICAL NEWS, August 1, 1896.

read. He could utter monosyllables slowly and with an explosive sound of the lips, so as to be understood after two or three ineffectual attempts. Unfortunately his right hand was at first nearly paralyzed, and after he regained strength in this hand, it was used so awkwardly that his writing was indistinct. The writing with the left hand was no better than with the right. None of the letters were well formed, but there was no transposing or omission of words or letters. There was no evidence that Broca's convolution was affected. His attempt at writing showed no mis-spelling or agraphia, but rather a dysgraphia. The lesion at the operation was limited to the lower portions of the central convolutions (ascending frontal and parietal). This case, as well as the one reported by Mills, points very conclusively to the existence of an orolingual center concerned in speech. It is probable that this center is bilateral, but so far as I am aware, no cases of lesion in the orolingual center on the right side in right-handed persons have been studied and reported.¹ Neither in the case reported by Mills, nor in the one reported by me, was the inability to utter words complete, as we would expect to find if the center is unilateral.

From a study of the symptoms found in these two cases of orolingual paralysis, and from the flattering results of the operation in the case reported by me, it seems to me that we are justified

¹ Dr. Parkhill has recently referred a patient to me with lesion in the right orolingual center, of thirty-four years' duration. We will report this case, conjointly, soon.

in recognizing an orolingual cortical center which is concerned in speech, and that under certain conditions, operative procedures, when this center is diseased, may be followed by partial restoration of the power of articulation.¹ No further comments on the last case of the series are needed beyond what are made in connection with the report of the case.²

Turning now to the cases of sensory aphasia reported in this series,³ we find in the first⁴ that the lesion was limited to the angular gyrus, its subcortical region and the anterior portion of the occipital lobe, that there was a condition of apraxia for all objects except those that were very familiar, and that this existed for all the sense memories. The patient manifested a state of verbal amnesia for all objects save those with which he had been most familiar. There was no auditory disturbance of speech. He could not recognize letters, figures, and colors seen. He could not understand printed and written words seen, nor read inaudibly or aloud. He could not recall objects, the names of which were seen. The power to write voluntarily, at dictation, to copy and to write the names of objects presented to him by the various senses, was at first almost completely lost. He was unable to read. He failed partially at first to write his own name or to read it after it had been written by another. He usually was unable to recognize a letter by tracing it

¹ MEDICAL NEWS, August 15, 1896.

² *Ibid.*

³ *Ibid.*, June 6 and 20, and July 11, 1896.

⁴ *Ibid.*, June 6, 1896.

with his finger or pencil, the movements being guided by another; neither could he call up mentally the appearance of an object, figure, letter, or word. He made a partial failure in counting numbers or money. He could not recognize a single card, although he had formerly been very fond of games.

In the third case¹ the lesion was extensive, involving the Rolandic parietal and angular regions and the centrum ovale of these. Apraxia was pronounced; verbal amnesia was present; he copied poorly, but mechanically; recognized a tune, and could sing if some one led; could recognize only a few spoken names; could name any word that was spelled aloud; was unable to read, or to write voluntarily, and could not read what he copied; did not recognize colors, but did objects; could not count in numbers or calculate, but could count money. In the second case² the lesion was limited to the posterior halves of the first and second temporal convolutions and the centrum ovale beneath this portion of the cortex. The patient was mind- and word-deaf; verbal amnesia was present, apparently; there was partial apraxia; he could read, but did not seem to understand; he read aloud so that any one could understand him; he could write voluntarily his name and whisky; did not recognize playing-cards; and copied fairly well, converting printing into script. There was no visual disturbance of speech.

¹ MEDICAL NEWS, July 11, 1896.

² *Ibid.*, June 20, 1896.

On reviewing the symptoms, we find that all the cases of sensory aphasia presented a condition of apraxia and verbal amnesia, but in none of them were these defects complete. In the two in which the lesion involved the angular region, there were visual disturbances of speech, such as word-blindness and inability to call up mentally the appearance of a word or letter. In the case in which the lesion was limited to the first and second temporal convolutions, there were auditory disturbances of speech, such as mind- and word-deafness at first, later word-deafness and inability to call up mentally the sound of a word or letter spoken aloud. In none of the cases was there an inability intelligently to see objects (mind-blindness). In only one was there hemianopsia, and this occurred in the case in which the lesion penetrated the centrum ovale deeply beneath the angular gyrus. In the case of extensive lesion in the angular region, there was loss of power to read or write, while in the other, in which the lesion was less extensive, but involving the angular gyrus, there was at first an almost complete loss of power to read and write. In the case in which the lesion affected the temporal convolutions, the patient could both read aloud and write, but did not seem able to understand what he had read or written. All the patients could write their names, although it was done imperfectly by those suffering from visual disturbances of speech. None of the three could count in numbers, but one could count money.¹

¹ MEDICAL NEWS, July 11, 1896.

None could at first play a game of cards. In one, the case with an extensive lesion involving the Rolandic parietal and angular regions, the ability to recognize a word spelled aloud was very good.

We may conclude, from a study of the symptoms presented by these three cases of sensory aphasia, that apraxia and verbal amnesia have no localizing value, except to place the lesion in the sensory or receptive side of the speech mechanism; that inability to count or to play games of cards have no localizing value, as these defects are found in a few cases of motor aphasia; that word-blindness places the lesion in or near the angular gyrus; that word- or mind-deafness is evidence that the lesion is in the posterior portions of the first and second temporal convolutions. In each of these cases the subcortical as well as cortical region concerned in speech was affected.

All the patients suffering from sensory aphasia, with one exception, copied mechanically, transcribing writing into script and printing into printing, giving each letter the amount of shading found in the original, and that all the cases of motor aphasia transcribed printing and writing into script. This seems to be of considerable diagnostic importance in distinguishing the motor from the sensory forms of aphasia.¹

¹ A little brochure that contains much of deep interest to every student of aphasia has been written by Sigm. Freud, "Zur Auffassung der Aphasien; Eine Strittische Studie," Leipzig und Wien, 1891. So far as I am aware, this little book has not attracted much attention, especially in England and America. The author is at variance with the theories of Wermke and Leichtheim, but the practical results of his conclusions are nearly the same as those of the writers just referred to.



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